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SIZE AND FREQUENCY OF FLUCTUATIONS

THIS CHAPTER DEALS principally with the amplitude aspects of the relations between new orders, production, and shipments. It describes the comprehensive series for the postwar period, in current and constant dollars, with the aid of charts and comparisons of relative cyclical amplitudes. The analysis is then extended to data for individual industries, for selected economic indicators, and for the interwar period. Measures based on statistical decomposition of the time series by type of movement are used in this part of the chapter.

Postwar Cycles in Comprehensive Series

Current Data on New Orders and Shipments of Major Industries

The main body of data on the value of manufacturers' new orders and shipments is the monthly compilation by the U.S. Department of Commerce, which goes back to the Industry Survey established in 1939 by the Office of Business Economics (OBE). The OBE data cover the years after World War II and are given in changing prices of the period; the over-all totals for the durable and nondurable goods sectors begin in 1939.

In 1957, the processing of the Industry Survey was transferred within the Commerce Department to the Bureau of the Census, which published, in October 1963, a major revision of the survey series on manufacturers' shipments, orders, and inventories.[1] The new Census

[1] Bureau of the Census, *Manufacturers' Shipments, Inventories, and Orders: 1947–1963 (Revised)*, Washington, D.C., 1963.

data carry the totals for durable goods industries, nondurable goods industries, and all manufacturing, back to 1947; the series for component industries and the newly introduced market-grouped categories, back to 1953.

The revised data set differs from the old one in several respects: (1) The coverage of the survey has been broadened significantly, particularly with regard to large companies; (2) the sample design has been revised as a probability sample to give better representation of the entire manufacturing universe; (3) improved industry reporting and new benchmark levels have permitted a reorientation from a company base to a divisional or establishment base; (4) as a result, the new survey is able to provide more detailed and homogeneous industry figures as well as aggregates for market categories which cut across the industry groups, separating materials from final products and, among the latter, consumer goods from industrial equipment, defense items, etc.[2]

Because of these differences in concept or estimation procedure, the old and new component series differ rather substantially, though primarily in level and much less in change characteristics such as amplitudes and timing. Before the 1963 revision was published, I had completed an analysis of the earlier data, and the charts and tables that follow are based in part on that analysis. However, much of this work was replicated with the aid of the new series, to keep the study as up to date as possible and to incorporate the presumably improved statistical information now available. A warning is due here that these latest data are not strictly comparable with the earlier series used for the years before 1953, though care has been exercised to avoid any inferences that could be invalidated by such noncomparabilities. Only for the most comprehensive aggregates are the currently published series continuous over the entire postwar period.

In the Commerce data of all vintages, the comparability of the orders and shipments figures is assured by the method of their estimation: the value of new orders in any month t is derived by adding to the value of shipments in the same month the *change,* centered on t, in the estimated end-of-month totals of unfilled orders. This procedure is ap-

[2] For a further discussion of these and some other features of the Commerce data and some comparisons of the old and new series, see *ibid.*

plied to data before seasonal adjustment. The resulting figures are net of cancellations.[3]

Chart 3-1 shows the most comprehensive of the Commerce series. The pair of series plotted in the middle relates to all durable goods industries and that at the bottom to the group of four nondurable goods industries reporting unfilled orders (textiles, leather, paper, and printing and publishing). The pair of series plotted at the top of the chart relates to the total manufacturing sector and thus covers, in addition to the above two groups, those nondurable goods industries for which new orders and shipments are assumed to have equal values. In this and the following charts, new orders and shipments are drawn to the same semilogarithmic vertical scales and superimposed upon each other for each industry or group of industries. All series are shown in seasonally adjusted form.

Chart 3-2 covers those major-industry components of the Commerce set for which matching figures on new orders and shipments were published in the 1963 revision. Where the latest revised figures are not available for the period before 1953, data of the previous vintage are used to cover the earlier postwar years. The results should not be treated as continuous series, as indicated in the charts which keep the two segments separate. But comparisons of levels and longer movements show good over-all agreement between the new and the old data, as illustrated by the overlaps provided in Chart 3-2 for the years 1953–54.

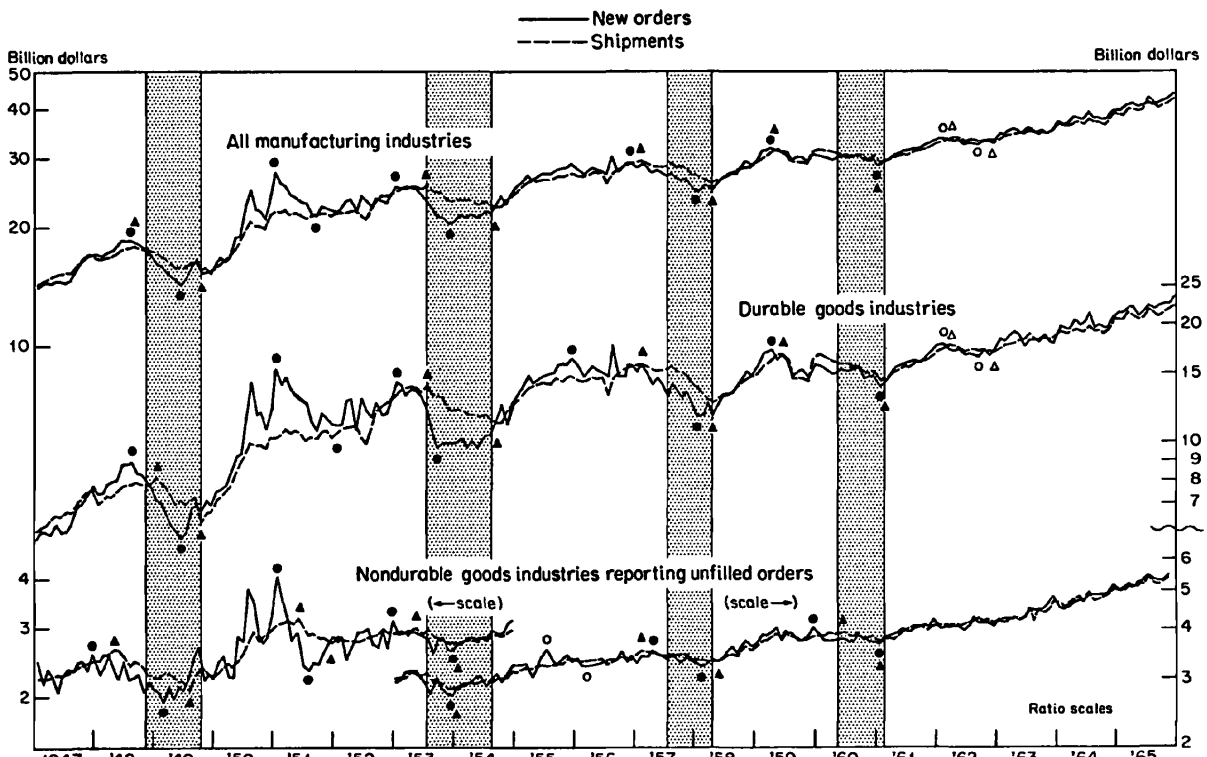
Main Differences Between Industries and Changes over Time

The charts serve several basic purposes both in this chapter and in the following one, which is concerned with the timing relations between new orders and shipments. They are designed to bring out the relative levels and amplitudes of the paired series. Their inspection corroborates some of our earlier results. New orders tend to exceed shipments on the rise and to fall short of them on the decline. Not only the cyclical fluctuations but also the short "irregular" movements are seen to be typically larger in new orders than in shipments. The markings for the turning points emphasize the evident tendency of new orders to move ahead of shipments.

[3] See Chapter 2, note 25, for the definitions underlying the estimation of N_t as the sum of ΔU_t and S_t.

Chart 3-1

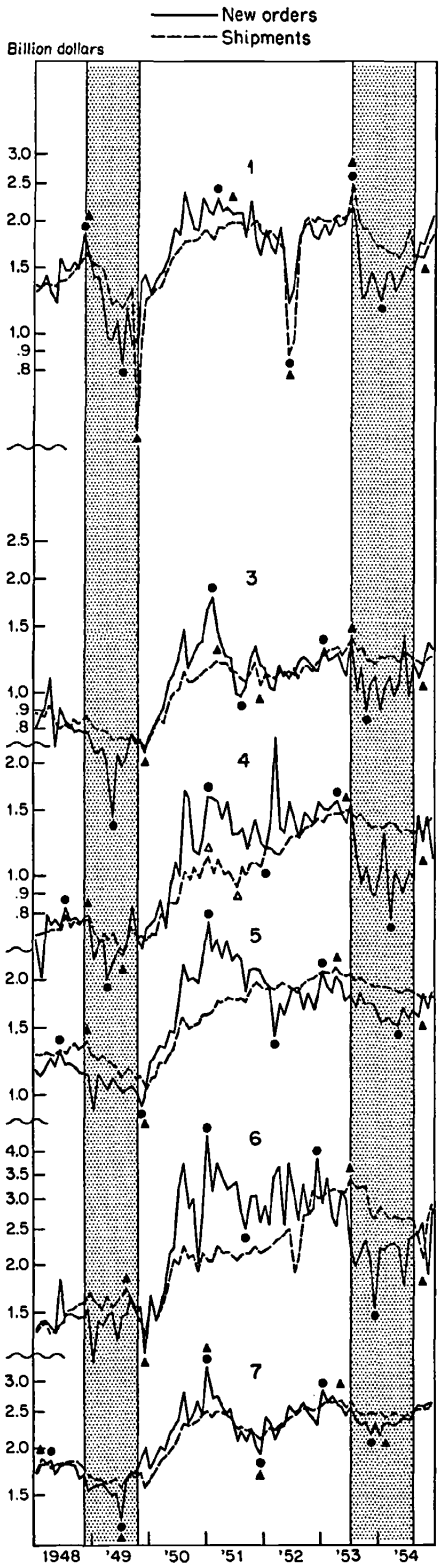
Value of Manufacturers' New Orders and Shipments, All Manufacturing, Durable Goods Industries and Nondurable Goods Industries Reporting Unfilled Orders, 1947–65



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles in new orders; black triangles, shipments. Circles and white triangles identify short cycles or retardations in new orders and shipments, respectively. Series are seasonally adjusted.

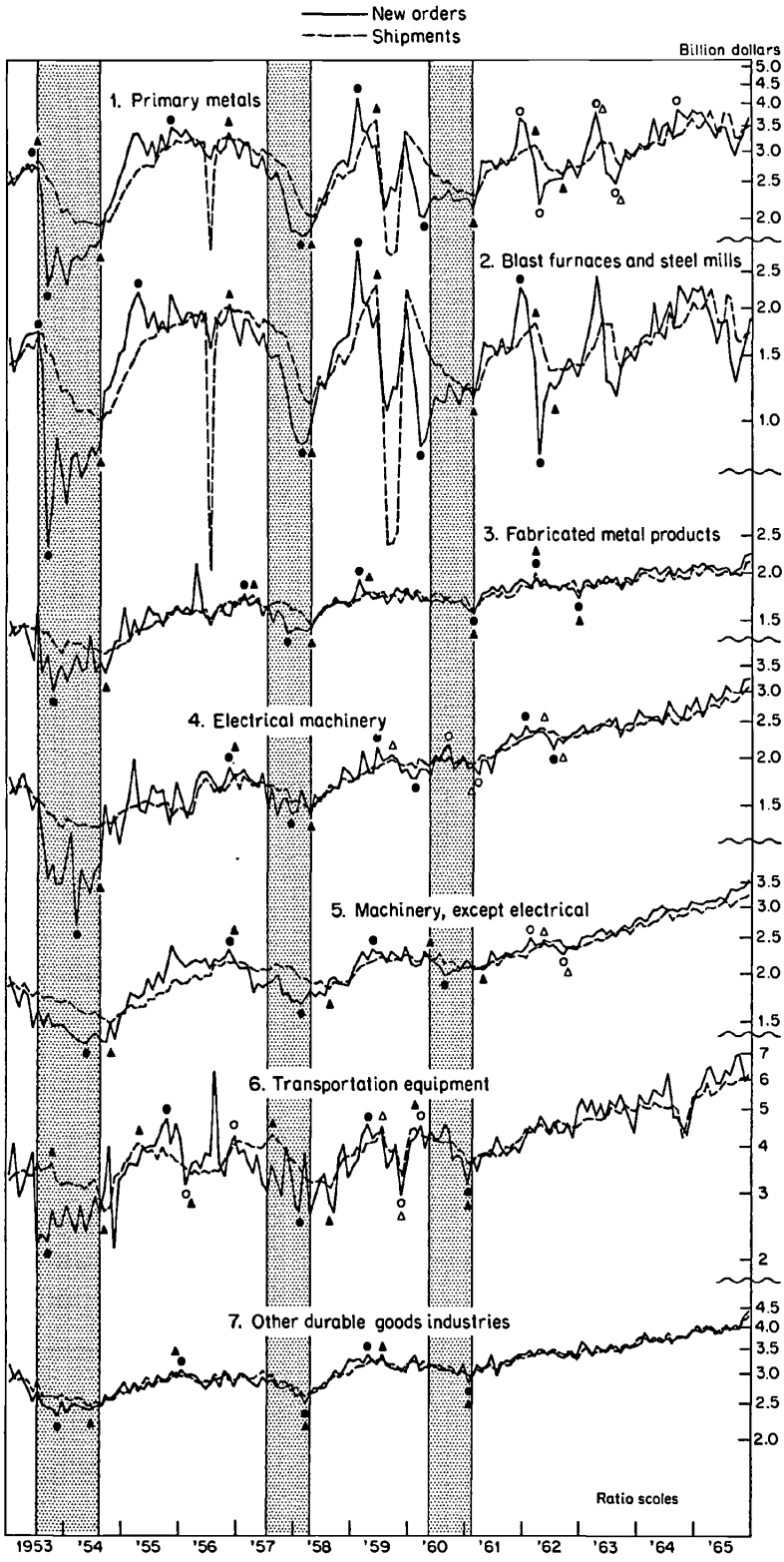
Source: Bureau of the Census.

Chart 3-2
Value of Manufacturers' New Orders and Shipments, Seven Major Durable Goods Industries, 1948–65



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles in new orders; black triangles, shipments. Circles and white triangles identify short cycles or retardations in new orders and shipments, respectively. Series are seasonally adjusted.

Source: 1948–54: U.S. Department of Commerce, Office of Business Economics; 1953–65: Bureau of the Census.


New orders
Shipments
Billion dollars
1. Primary metals
2. Blast furnaces and steel mills
3. Fabricated metal products
4. Electrical machinery
5. Machinery, except electrical
6. Transportation equipment
7. Other durable goods industries
Ratio scales
1953
'54
'55
'56
'57
'58
'59
'60
'61
'62
'63
'64
'65

However, while these characteristics are general and often conspicuous, the intensity and regularity with which they appear vary greatly for different industries and periods. First, there is the smoothing effect of aggregation: the series that cover broad divisions of industry are in general less erratic than those relating to the more narrowly defined components (compare, e.g., the over-all aggregates in Chart 3-1 with the major-industry series in Chart 3-2, for new orders and shipments, separately). This, of course, is merely one manifestation of the familiar rule applicable to various types of economic process.

Second, new orders and shipments move much closer together in the nondurable goods sector of manufacturing than in the durable goods one. The nondurable aggregates in Chart 3-1 include only those industries that report unfilled orders (textiles, leather, paper, and printing and publishing). The other components of the sector, with considerably larger values of production and sales, work predominantly to stock and for them new orders and shipments are assumed to be identical in the Commerce statistics. Thus, had I plotted the all-inclusive series for the nondurables, the differences between orders and shipments would have appeared much smaller still. As it is, relatively large discrepancies between the two series for the four-industry group reporting unfilled orders are observable only in the 1948–49 recession and during the Korean War period in 1950–51; for the new set of data beginning in 1953, the discrepancies are small indeed. Another fact apparent in Chart 3-1 is more familiar: the amplitudes of fluctuations are considerably larger for the durable than for the nondurable goods industries, and this applies to both new orders and shipments.

Third, the major-industry components of the durable goods sector also display a great deal of diversity in these respects (Chart 3-2). The difference between new orders and shipments is greater, and the fluctuations of both series are much larger, in primary metals than in fabricated metal products. Orders are more erratic for electrical than for nonelectrical machinery and show less systematic cyclical deviations from shipments (persistent and large deviations for electrical machinery are limited to the Korean War period and the 1953–54 recession). Orders for transportation equipment have particularly large irregular movements of very short duration, which are radically smoothed out in shipments. This will be shown to reflect primarily the relationships in the nonautomotive component of that industry, which

is dominated by large and expensive items (aircraft, ships, railroad equipment) that are produced to order, often with long delivery periods. The automotive component (motor vehicles and parts) shows, in contrast, only small divergencies between new orders and shipments, and behaves typically like an industry which produces primarily to stock.[4] In the remaining group of "other durable goods industries" new orders and shipments also run close to each other, with shipments being smoother and lagging but slightly. This group is composed mainly of stone, clay, and glass products, furniture, and lumber, which are largely items made to stock or (like furniture in part) made to order but with rather short delivery periods.

Finally, the relations concerned have undergone certain changes over time which are reflected in our charts. In the period since 1958–60, new orders and shipments differed much less than in the previous twelve or fourteen years covered. This implies that the changes in unfilled orders have become smaller in the first half of the 1960's. Direct evidence that this has indeed happened is given in Chapter 6, and shows that backlogs of manufacturers' orders generally have markedly diminishing fluctuations around downward or horizontal trends during these latter years.

On the whole, there is a one-to-one correspondence between the major movements in new orders and shipments, but a significant divergence from it occurred in 1950–52. The outbreak of the Korean War caused a rush of forward buying motivated by fear of shortages and price rises; this receded at the end of 1950 when hope spread that the conflict might end soon, but another wave of buying started when the war was intensified by Chinese intervention. These rises brought new orders to levels far above those of shipments, thus leading to a very large accumulation of unfilled orders. When new orders declined in 1951–52, shipments of durable goods continued to increase, though at a slower pace, reflecting work on the previously accumulated orders (Chart 3-1). The continued rise of shipments is particularly evident in industries with longer average delivery periods, such as nonelectrical machinery and (nonautomotive) transportation equipment; in contrast, shipments declined in 1951 in response to the fall in new orders in

[4] In fact, unfilled orders of motor vehicle manufacturers are relatively small, consisting as they do largely of military orders; the bulk of production here is represented by automobiles which are shipped to dealers who hold the inventory of finished cars.

industries working largely to stock or with short delivery lags, such as the nondurables and the group of "other durables" (Chart 3-2).

Relative Cyclical Amplitudes of the Major-Industry Series

Table 3-1 presents percentage amplitudes of cyclical rises and falls for the series that were presented in Charts 3-1 and 3-2. With very few exceptions, the current value of new orders (N) rose more in percentage units than the value of shipments (S) in each successive expansion of these series. Similarly, N as a rule fell more than S in each of the successive specific contractions.[5]

Since the amplitudes of the rises are based on the initial low levels and those of the falls on the initial high levels, the former are in a sense overstated and the latter are understated. Using average cyclical levels as bases would correct for this "bias," which should be recognized in reading the table. However, for our comparisons, which aim mainly at differences between variables and industries, the simpler measures applied are deemed adequate. As the effects of the base differences on rises and falls tend to cancel each other, the over-all averages taken without regard to sign (column 11) would be but weakly influenced by this technical factor.

The series have upward trends and their rises are substantially larger than their falls, as illustrated in the charts and demonstrated in the measures of Table 3-1. This difference is real enough and quite general, even though it should be somewhat discounted because of the base effects just noted. More interestingly, the relative amplitudes of rises show a tendency to decline in three successive episodes: They were on the whole smaller in 1958–59 than in 1954–57 and smaller in the latter period than in 1949–53. However, the most recent rises of the 1960's (which were still in progress at the time of this analysis), have already exceeded the earlier expansions of the mid- and late 1950's, though not, in general, those of 1949–53 (compare columns 2, 4, 6, and 8). A tendency for the recent declines to become progressively smaller is also observable in Table 3-1 (compare columns 1, 3, 5, and 7). Of course, these differences themselves are in part a reflection of the

[5] The apparent exceptions are due to special causes or are not really significant. Thus the primary metals figures for 1948–53 (Table 3-1, columns 1 and 2) are affected by the steel strike in 1949, which caused a lower trough level in shipments than in new orders (compare Chart 3-2). Elsewhere the differences between the amplitudes are negligible in those cases in which the movement of S seems to exceed the movement of N (see the totals for nondurable goods in Table 3-1).

growth trends; for example, it would take a much larger absolute rise in 1961–65 than in 1949–53 to produce the same relative rise, because the series had reached a much higher level in 1961 than in 1949. Nevertheless, it is worth noting that the relative fluctuations in these series have in general become markedly smaller in the recent years than they were earlier in the postwar period (see Charts 3-1 and 3-2 and Table 3-1).

Along with the reduction in the percentage amplitudes of cyclical movements, in shipments as well as new orders, the excess of the amplitudes of new orders over those of shipments has also tended to decrease. Thus the ratios of the relative amplitudes of shipments to new orders have increased in each of the successive contractions and in each of the successive expansions of the period 1953–61 for the total durable goods sector.[6]

It is well known that production and employment tend to undergo much larger fluctuations in durable goods industries than in nondurable goods industries. The same is true of both new orders and shipments: The cyclical amplitudes of orders are more than 3 to 5 times larger in durables than in nondurables, and those of shipments are more than 2 to 3 times larger (the differences are smaller for rises than for falls; compare columns 9–11 for total durable and total nondurable orders and shipments). Among the nondurables, however, the industries that report unfilled orders (textiles, leather, paper, and printing and publishing) show considerably larger fluctuations than the rest, as can be inferred from the averages in the last four lines of the table.

Of the major industries in the durable goods sector, primary metals and, particularly, its blast furnaces component, persistently had the largest cyclical amplitudes in percentage terms, both for rises and falls. Transportation equipment had smaller movements, while electrical and nonelectrical machinery series fluctuated less and the fluctuation of the fabricated metals series, on the whole, was still less. The "other durable goods" category shows the smallest amplitudes of all, in most instances and on the average. These rankings have been quite persistent in both expansions and contractions, particularly since 1953. Also, the ranks of the industries according to the amplitudes for

[6] The ratios for the four postwar contractions (1948–49, 1953–54, 1957–58, and 1959–61) are 0.47, 0.63, 0.79, and 0.86, respectively. The ratios for the four expansions (1949–53, 1954–57, 1958–59, and 1961–65) are 0.76, 0.67, 0.73, and 0.84.

Table 3-1

Percentage Amplitudes of Cyclical Expansions and Contractions, Value of New Orders (*N*) and Shipments (*S*), by Major Industries, 1948–65

	Percentage Rise (+) or Fall (−) in Series [a]								Av. of Periods with Rise [d]	Av. of Periods with Fall [d]	Av. Amplitude of Rises and Falls [d]
N or *S*	1948–49 Fall (1)	1949–53 Rise [b] (2)	1953–54 Fall (3)	1954–57 Rise (4)	1957–58 Fall (5)	1958–59 Rise (6)	1959–61 Fall (7)	1961–65 Rise [c] (8)	(9)	(10)	(11)
ALL MANUFACTURING INDUSTRIES											
N	−20	+72	−17	+36	−12	+26	−8	+50	+46.0	−14.3	30.2
S	−14	+64	−10	+29	−11	+20	−6	+44	+39.4	−10.0	26.7
DURABLE GOODS INDUSTRIES, TOTAL											
N	−32	+135	−27	+57	−24	+41	−14	+63	+73.7	−24.6	49.1
S	−15	+102	−17	+38	−19	+30	−12	+53	+55.7	−15.7	35.8
PRIMARY METALS, TOTAL											
N	−38	+97	−47	+128	−48	+110	−42	+76	+102.7	−43.9	73.3
S	−40	+132	−30	+68	−36	+54	−28	+50	+76.2	−33.6	54.9
BLAST FURNACES, STEEL MILLS											
N	n.a.	n.a.	−53	+175	−58	+166	−58	+118	+153.1	−53.7	104.7
S	n.a.	n.a.	−38	+94	−43	+71	−37	+68	+77.7	−39.6	58.7
FABRICATED METAL PRODUCTS											
N	−33	+102	−27	+54	−14	+24	−10	+40	+55.0	−21.0	38.0
S	−16	+80	−14	+37	−12	+18	−8	+31	+41.4	−12.5	27.0

ELECTRICAL MACHINERY											
N	−22	+155	−42	+81	−18	+34	−4	+69	+84.6	−21.4	53.0
S	−12	+120	−21	+29	−13	+32	−1	+59	+60.1	−11.8	35.9
MACHINERY, EXCEPT ELECTRICAL											
N	−21	+100	−26	+68	−24	+33	−11	+76	+69.3	−20.4	44.9
S	−18	+93	−19	+42	−12	+18	−6	+57	+52.5	−13.9	33.2
TRANSPORTATION EQUIPMENT											
N	−12	+140	−30	+91[e]	−33	+40	−18	+87	+89.6	−23.1	56.3
S	−13	+122	−18	+50[e]	−24	+32	−12	+63	+66.8	−17.0	41.9
OTHER DURABLE GOODS INDUSTRIES[f]											
N	−16	+84	−21	+23	−12	+27	−9	+46	+44.8	−14.7	29.8
S	−10	+62	−14	+19	−10	+22	−7	+40	+35.9	−10.4	23.1
TOTAL NONDURABLE GOODS INDUSTRIES											
N	−11	+34	−5	+22	−2	+12	−0.1	+36	+27.6	−4.5	15.2
S	−12	+33	−4	+23	−3	+12	+0.3	+35	+25.4	−4.8	15.1
TOTAL NONDURABLES WITH UNFILLED ORDERS[g]											
N	−16	+52	−11	+26	−6	+21	−5	+50	+37.1	−9.6	23.3
S	−16	+40	−8	+23	−5	+16	−3	+46	+31.5	−8.0	19.8

Notes to Table 3-1

Note: The amplitude measures in columns 3–8 for all industries and those in columns 1 and 2 for all manufacturing, total durable goods, and total nondurable goods industries are based on the new Census data (1963 revision). For the other industries, the measures in columns 1 and 2 are based on the earlier OBE data (the revised series for the component industries begin in 1953).

[a] The annual dates given refer to the expansions and contractions in total manufacturers' shipments. The corresponding movements in the component series may have different dates. As a rule, the amplitude of each successive rise and fall in the given series is measured between the average standings of the seasonally adjusted series in the three-month periods centered on the initial and terminal turns, and all amplitudes are expressed in percentages of the initial-turn levels. However, the high levels attained by the series late in 1965 were used as terminal values for the measured amplitudes of 1961–65 (column 8), even though the expansions apparently still continued at the time this analysis was being performed; hence these figures refer to truncated movements and in this sense understate the (currently unknown) "true" amplitudes of the rises that began in 1960–61.

[b] In this period, new orders for durable goods rose to steep peaks in 1950–51, then declined sharply in 1951, finally increased erratically and moved slowly in 1952 (see Charts 3-1 and 3-2). For some industries, these movements can be matched with those of shipments. To make the results for the different industries more comparable, amplitude measures for these additional movements are not included in the table, but they are shown below:

	Total Durable		Primary Metals		Fabricated Metal Products		Other Durable Goods	
	N	*S*	*N*	*S*	*N*	*S*	*N*	*S*
1949–51 rise	+87	+52	+111	+110	+172	+61	+87	+52
1951–52 fall	−22	−12	−36	−41	−38	−6	−22	−12

[c] Significant retardations interrupted these rises in 1962 in several major industries (see Charts 3-1 and 3-2). The following tabulation illustrates the magnitudes of the movements involved.

	All Manufacturing		Total Durable		Primary Metals		Blast Furnaces		Fabricated Metal Products	
	N	*S*	*N*	*S*	*N*	*S*	*N*	*S*	*N*	*S*
1961–62 rise	+14	+14	+22	+20	+64	+33	+82	+28	+16	+7
1962 fall	−2	−1	−4	−2	−27	−13	−38	−18	−4	−3

[d] The averages in column 11 are taken without regard to sign, but not those in columns 9 and 10. Because of rounding, the figures shown may differ from ones computed directly from the listings in columns 1–8.

(continued)

Notes to Table 3-1 (concluded)

[e] Short but substantial declines interrupted these rises in 1955–56 (see Chart 3-2). The amplitudes of the increases that started in 1953–54 and ended in 1955 were +82 and +42 for new orders and shipments, respectively; those of the declines in 1955–56 were −18 and −14.

[f] Includes stone, clay, and glass products; lumber and wood products; furniture; instruments and related products; and miscellaneous, including ordnance.

[g] Includes textile mill products; leather and leather products; paper and allied products; and printing and publishing.

new orders and shipments have tended to be remarkably similar: the Spearman rank correlation coefficients (r_s) exceed .85 for each of the six periods with rise or fall in 1953–65. The correlations between the ranks based on average amplitudes are perfect ($r_s = 1$) for rises and for rises and falls combined, while the correlation for falls is .86.

The high degree of cyclicality and volatility of new orders received by such industries as iron and steel, transportation equipment (particulary nonautomotive), and machinery, confirms the long-held idea that investment demand is often very unstable. While shipments (and output) fluctuate much less than new orders, they nevertheless vary considerably more in these industries than elsewhere in the manufacturing sector. And it is in these industries that production is to a large extent order oriented, resulting in order leads of substantial analytical and predictive interest.

Market Categories

For the new Census series, industry data have been regrouped into major market sectors covering consumer goods, equipment, and materials. The composition of these "market categories" follows below.[7]

Home goods and apparel: Knitting and floor covering mills; apparel; household furniture and fixtures; leather products (other than industrial and cut stock); kitchen articles and pottery; cutlery, handtools, and hardware; household appliances; ophthalmic goods, watches, and clocks; and miscellaneous personal goods.

Consumer staples: Food and beverages; tobacco manufactures; die-

[7] This is a short description; for a detailed listing of the SIC industries included, see Census, *Manufacturers' Shipments (Revised)*, App. B.

cut paper and board; newspapers, periodicals, and books; and drugs, soaps, and toiletries.

Equipment and defense items, except automotive: Furniture and fixtures, other than household; machinery, electrical and other (excluding household appliances and some others); aircraft, shipbuilding, railroad and streetcar equipment; scientific and engineering instruments; and ordnance.

Automotive equipment:[8] Motor vehicles and parts; motorcycles, bicycles, boat building, trailer coaches; and tires and tubes.

Construction materials, supplies, and intermediate products: Wood products (except containers); building paper; paints; paving and roofing materials; stone, clay, and glass products (other than kitchen articles, pottery, and glass containers); and building materials (fabricated metals) and wire products.

Other materials and supplies and intermediate products: Fats and oils; broad-woven fabrics and other textiles (except those in home goods and apparel); wooden and glass containers; pulp, paperboard, and other paper products; printing and publishing (except the items in consumer staples); chemicals and allied products: industrial, fertilizers, and miscellaneous; petroleum and coal products (except paving and roofing materials); rubber and plastics (except tires and tubes); leather, industrial products, and cut stock; primary metals; fabricated metal products: cans, barrels, and drums, and others n.e.c.; internal combustion engines; machine tools and machine shops; electrical industrial apparatus, electronic components, and other electrical machinery n.e.c.; aircraft parts; photographic goods, watch cases; and other durable goods, except personal and ordnance.

In short, these groupings provide both a division between final products and materials and a further division of final products between consumer goods and equipment for business and government use.

In addition, data for the following three "supplementary market categories" are available (for consumer durables only since 1960):

Consumer durables: Same as home goods and apparel (above), except that knitting and floor covering, apparel, and the leather products are excluded.

[8] This is treated as a separate market grouping, instead of being divided between consumer goods, equipment (buses and trucks), and materials (motor vehicle parts), because the Industry Survey reports do not separate the value of cars and trucks.

Defense products: Communication equipment; complete aircraft; aircraft parts; and ordnance (part of group 3 above).

Machinery and equipment industries: Machinery, except electrical (excluding farm machinery and machine shops); electrical machinery (excluding household appliances, communication equipment and electronic components); shipbuilding; and railroad and streetcar equipment.

Chart 3-3 presents the seasonally adjusted series on new orders and shipments for each of the nine market categories just described as well as for total materials (which includes the "Construction materials" and "Other materials . . ." groups identified above). It is clear that the goods purchased by the consumer are overwhelmingly made to, and sold from, stock. New orders and shipments of these classes of goods move closely together and show very small, and for the most part apparently random, differences. In particular, N and S are virtually identical for consumer staples. The two variables are somewhat more differentiated for home goods and apparel, but here too the deviations are generally small, except during the decline and initial rise associated with the 1953–54 recession. The series for consumer durables are very short, since they begin in 1960. They closely resemble their counterparts for the home goods group, which covers the same products along with some nondurables.

In contrast, the equipment series cover in large part goods manufactured to order, and the picture they present is very different. In 1953–58, particularly, new orders for nonautomotive equipment and defense products moved in much wider swings than shipments, which also lagged behind the orders by long intervals. In 1959–62, a period marked mostly by sluggish increases and retardations in these series, the deviations between N and S became considerably smaller and predominantly erratic; but in 1963–65, when business moved up more briskly, new orders again repeatedly rose faster than shipments, only to fall back occasionally to the level of the latter. Throughout, shipments of equipment have followed a much smoother course than the highly volatile orders. New orders for defense products have been especially erratic, moving up and down in large seesaw patterns every few months. However, longer movements superimposed upon those irregular oscillations are also evident in the defense series during the 1950's. The timing of these movements was unfavorable as far as the business cycle is concerned: defense orders declined sharply just be-

Chart 3-3

Value of Manufacturers' New Orders and Shipments, Consumer Goods, Equipment, and Materials, Ten Market Categories, 1953–65

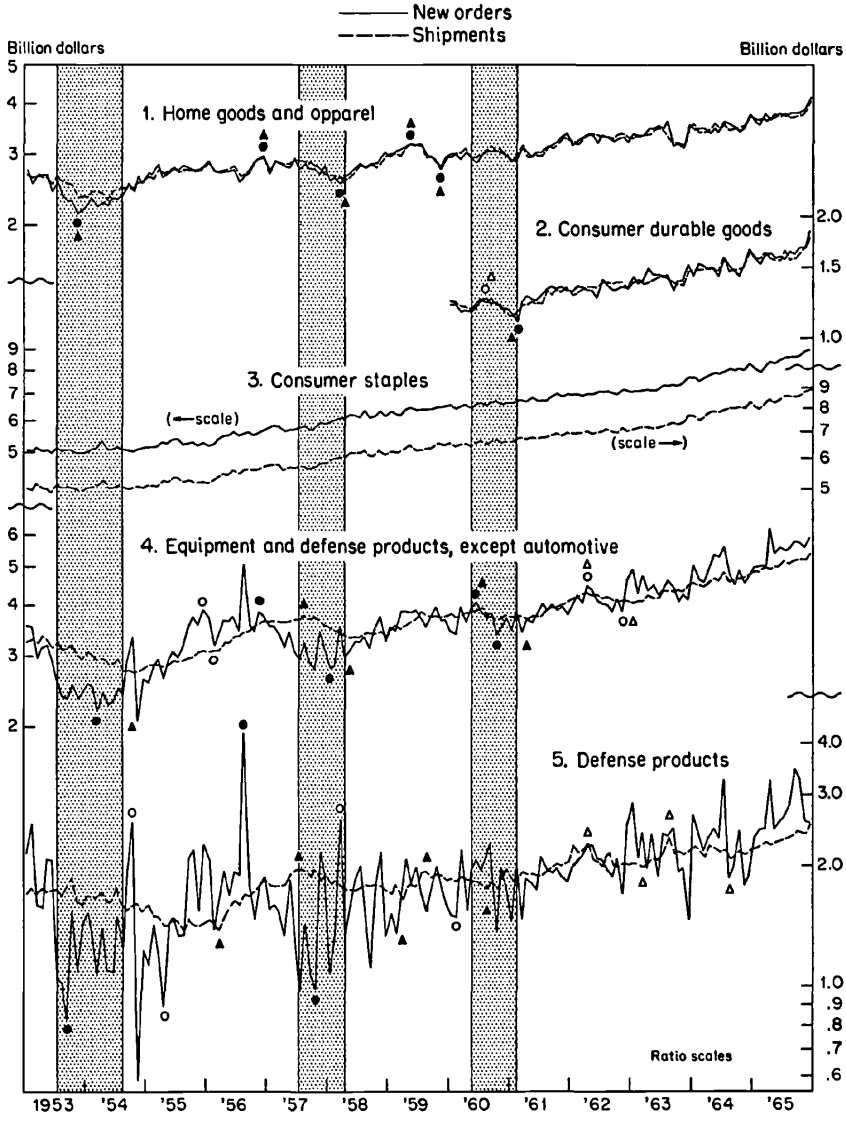
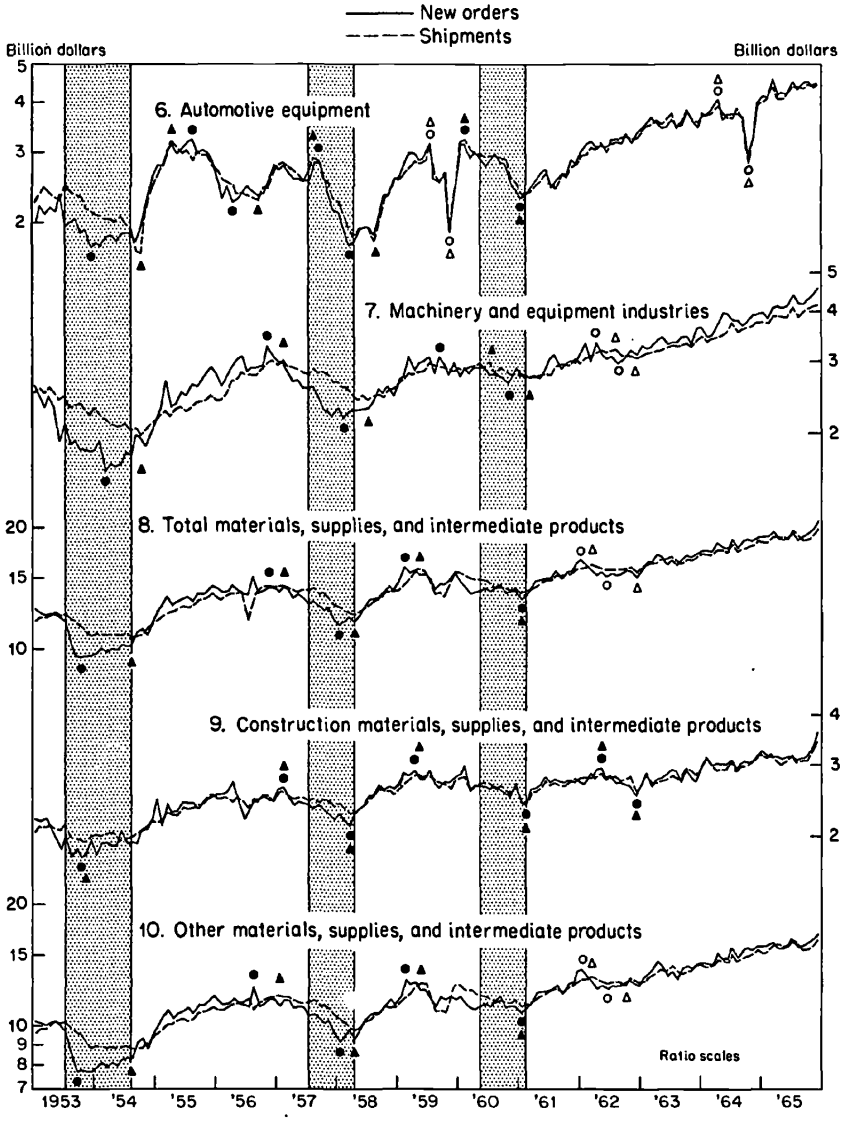


Chart 3-3 (concluded)



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles in new orders; black triangles, shipments. Circles and white triangles identify short cycles or retardations in new orders and shipments, respectively. Series are seasonally adjusted.

Source: Bureau of the Census.

fore and during the 1953–54 recession and again in 1956–57, prior to the downturn of aggregate economic activity in mid-1957. The recent (1963–65) increase in the short-period volatility of total equipment orders is also to a considerable extent (though by no means exclusively) due to renewed large variations in defense orders (see Chart 3-3).

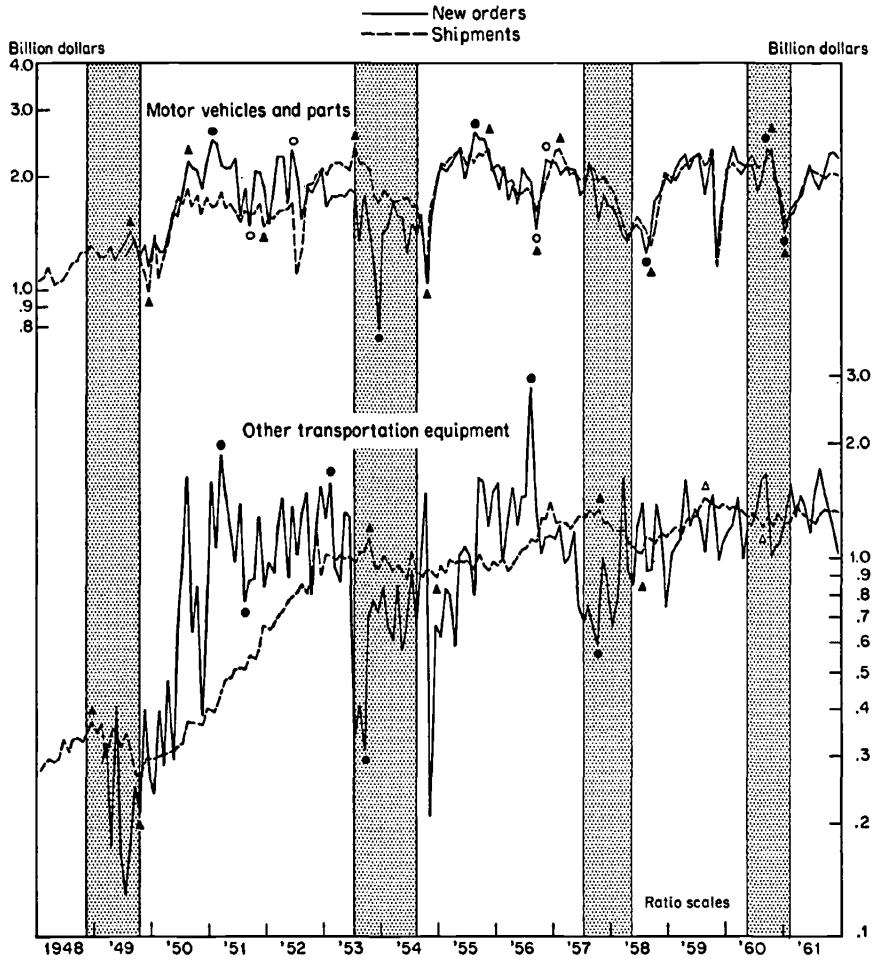
The series for machinery and equipment industries represent transactions related to the business outlays on "producer durable equipment."[9] They share much of their coverage with the corresponding series for nonautomotive equipment (other than defense products), but include also some types of machinery classified as components of the market group "Other materials and supplies and intermediate products." On the whole, new orders of the machinery and equipment industries are apparently smoother than new orders for total nonautomotive equipment and defense products, but the longer cyclical movements in these series are similar.

Unlike nonautomotive transportation equipment (aircraft, ships, railroad equipment), which is produced to order, usually with long lags of output and shipments behind new orders, motor vehicles are made largely to stock. The graph for automotive equipment shows N and S moving closely together most of the time (Chart 3-3), while the corresponding series for total transportation equipment differ by large amounts (Chart 3-2). Automotive orders follow a course that is only a little less smooth than that of shipments, while total transportation equipment orders are, in contrast to shipments, very erratic. This implies, of course, that new orders for transportation equipment excluding automobiles are even more erratic, and this is evident in the older data, which do distinguish between "motor vehicles and parts" and "other transportation equipment" (see Chart 3-4). But the charts suggest, too, that the divergence between the time paths of N and S for nonautomotive (and total) transportation equipment is in part also cyclical, i.e., reflected in longer and systematic movements, not just in very short irregularities.

Other evidence, on timing and on size of unfilled orders (Chapters 4 and 6), will confirm these statements. Meanwhile, let us merely note that motor vehicle manufacturers hold relatively small amounts of

[9] New orders for these industries will be used extensively in Part IV, below.

Chart 3-4
Value of New Orders and Shipments for Two Components of the Transportation Equipment Industry, 1949–61



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles in new orders; black triangles, shipments. Circles and white triangles identify short cycles or retardations in new orders and shipments, respectively. Series are seasonally adjusted.

Source: U.S. Department of Commerce, Office of Business Economics.

unfilled orders (for most of them the reported backlog figures are confined to military orders). The bulk of their production is represented by automobiles shipped to dealers, who then hold the finished car inventory for sale. Although cars come in a great variety of models, colors, and combinations of accessories, among which the buyer may choose as he wishes, individual customer specifications, as communicated to the dealer, are as a rule readily met by producers, without any significant delays in delivery.

It should be added that, according to the old series (Chart 3-4), new orders for motor vehicles did have much larger amplitudes than shipments in the years 1951–54, which include the Korean conflict and its aftermath. If this was so, it is possibly due in large part to military orders; but it seems idle to speculate about the matter, especially since the quality of these data is quite uncertain. In any event, after 1955 the two series, even according to the old data, show little difference in amplitudes and nearly coincident timing.[10]

Of the two parts of "materials, supplies, and intermediate products" (Chart 3-2), the group relating to construction had somewhat larger irregular, but smaller cyclical, fluctuations than the other, much larger group. The latter includes the highly cyclical metalworking industries, which is clearly reflected on several occasions, such as the long lead of new orders relative to shipments for this group at the 1953–54 upturns (compare the corresponding graphs in Charts 3-2 and 3-3).

Relative Cyclical Amplitudes of the Market-Category Series

Table 3-2 presents for the market groups the same information on the size of successive cyclical movements in new orders and shipments as Table 3-1 gave for the major industries.[11] The format is in both cases the same, and so is the general observation that N rises and falls more than S for each of the groups, with great regularity.

Comparisons of the amplitudes recorded in the different subperiods also merely yield a confirmation of what has been noted before: The

[10] The series for motor vehicles and parts in Chart 3-4 show much more erratic behavior in 1953–61 than do the corresponding series for total automotive equipment in Chart 3-3. While the latter data represent a somewhat larger aggregate, this difference may be due more to the smaller size of the samples underlying the older data in Chart 3-4. The cyclical movements, however, are broadly similar in the two charts, which is reassuring about the internal consistency of this evidence.

[11] Two categories, consumer staples (1953–65) and consumer durables (1960–65), are not included in this table. As seen in Chart 3-3, these series are dominated by upward trends and show no identifiable cyclical fluctuations.

declines tend to become smaller, while the latest rises already rival those of 1954–57 (the rises of 1958–59 were definitely the smallest but also the shortest in the recent years). Again, increases in the amplitude ratios S/N are frequently observed, as illustrated by the following results for home goods and apparel (HG), nonautomotive equipment and defense (NAE), machinery and equipment industries (ME), and total materials, supplies, and intermediate products (MSI).

Fall	*HG*	*NAE*	*ME*	*MSI*	*Rise*	*HG*	*NAE*	*ME*	*MSI*
1953–54	0.63	.48	.62	.50	1954–57	0.70	.65	.59	.68
1957–58	0.89	.45	.63	.83	1958–59	0.91	.40	.59	.87
1959–61	1.25	.33	.71	.91	1961–65	1.03	.69	.78	.88

The group of home goods and apparel has the smallest cyclical rises and falls in both new orders and shipments. Moving on to progressively larger average percentage amplitudes, construction materials and other materials rank second and third for new orders, followed by automotive equipment, defense products, and nonautomotive equipment. The rankings for shipments are similar,[12] but they differ in two respects from those for new orders: the ranks of defense products are consistently lower for S and the ranks of automotive equipment are consistently higher. This reflects two facts: (1) The production smoothing process is highly effective for the defense items, which have large backlogs and long delivery periods (the amplitudes of N are here, on the average, about two and a half times larger than those of S); and (2) in contrast, there is very little smoothing, if any, in the automotive group.

In short, the fluctuations of both new orders and shipments tend to be smallest for consumer goods, larger for materials (particularly the "Other materials" group, which includes the sensitive metalworking industries), and by far the largest for equipment. The groups with greater relative amplitudes are also, on the whole, the groups with greater weights of products manufactured to order. However, as an important special case, the automotive category represents a segment of the economy where the demand is highly variable but production is not "to order" in the sense used here. For this category, current pro-

[12] The r_s coefficients are .77 for periods of rise, .60 for periods of fall, and .71 for all six episodes in 1953–65.

Table 3-2
Percentage Amplitudes of Cyclical Expansions and Contractions, Value of New Orders (*N*) and Shipments (*S*), Nine Market Categories,[a] 1953–65

	Percentage Rise (+) or Fall (−) in Series[b]						Av. of Periods with Rise[d]	Av. of Periods with Fall[d]	Av. Amplitude of Rises and Falls[d]
N or *S*	1953–54 Fall[c] (1)	1954–57 Rise (2)	1957–58 Fall (3)	1958–59 Rise (4)	1959–61 Fall (5)	1961–65 Rise (6)	(7)	(8)	(9)
HOME GOODS AND APPAREL									
N	−19	+30	−9	+22	−8	+34	+28.5	−12.3	20.4
S	−12	+21	−8	+20	−9	+35	+25.3	−9.4	17.3
NONAUTOMOTIVE EQUIPMENT AND DEFENSE									
N	−33	+54	−20	+35	−9	+58	+48.9	−20.8	34.9
S	−16	+35	−9	+14	−3	+40	+29.2	−9.7	19.2
DEFENSE PRODUCTS									
N	−49	+88	−48	+27	−3	+84	+66.3	−33.7	50.0
S	−19	+36	−11	+10	−6	+34	+26.9	−12.2	19.5
NONAUTOMOTIVE EQUIPMENT, EXCLUDING DEFENSE									
N	−49[e]	+199	−31	+46	−13	+68	+104.5	−31.3	67.9
S	−24	+59	−14	+26	−11	+52	+45.7	−16.0	30.9
MACHINERY AND EQUIPMENT INDUSTRIES									
N	−34	+81	−27	+32	−7	+69	+60.7	−23.1	41.9
S	−21	+48	−17	+19	−5	+54	+40.2	−14.5	27.4

AUTOMOTIVE EQUIPMENT									
N	−16	+51[f]	−34	+69	−22	+88	+69.5	−23.9	46.7
S	−22	+50[f]	−32	+65	−23	+83	+65.6	−25.6	45.6
MATERIALS, SUPPLIES, AND INTERMEDIATE PRODUCTS									
N	−24	+47	−18	+31	−11	+42	+40.1	−17.3	28.7
S	−12	+32	−15	+27	−10	+37	+32.4	−12.4	22.4
CONSTRUCTION MATERIALS, ETC.									
N	−17	+41	−15	+29	−12	+33	+34.3	−14.6	24.5
S	−7	+31	−10	+23	−12	+31	+28.1	−9.5	18.8
OTHER MATERIALS, ETC.									
N	−21	+45	−19	+33	−11	+47	+41.7	−17.1	29.4
S	−12	+33	−16	+29	−10	+40	+33.9	−13.1	23.5

[a] For composition of these categories, see text.

[b] See Table 3-1, note a.

[c] The high levels from which these series start in 1953 were used as the base for the measures in this column, even where such levels cannot be positively identified as specific-cycle peaks.

[d] The averages in column 9 are taken without regard to sign, but not those in columns 7 and 8. Because of rounding, the figures shown may differ from ones computed directly from the listings in columns 1–6.

[e] Refers to the decline in the second half of 1953, which interrupted the very large irregular movements in the first half of the year (see Chart 3-3).

[f] There are additional movements in these series. To maintain comparability with the other groups, these movements are not included in the table. The amplitudes of the short but steep rises in 1954–55 were +73 in new orders and +64 in shipments; those of the ensuing declines in 1955–56 were −26 and −24; and those of the rises in 1956–57 were +18 and +19 (compare Chart 3-3). Had these measures been included, the averages in columns 7–9 for machinery and equipment industries would have been somewhat smaller (+61.7, −24.3, and 43.0 for new orders; and +57.6, −25.0, and 41.3 for shipments).

duction operations, as measured by shipments, follow quite faithfully the large short-term variations in demand, as measured by new orders.

Series in Constant Prices

In undertaking to compare new orders with production, one is confronted with a major gap in the data: the unavailability of aggregate volume estimates for new orders. In an attempt to bridge this gap, we have corrected the Department of Commerce estimates of the current value of manufacturers' new orders for changes in prices. This adjustment was applied to the major industry series in the OBE compilation for the years 1948–58; at the time, the revised Census data were not yet available. The deflating indexes used for these corrections are essentially combinations of the appropriate components of the Bureau of Labor Statistics wholesale price index.

Deflation procedures, even when carefully executed, seldom produce more than crude approximations, for the difficulties and pitfalls are many. Without fully describing at this point the procedures and data employed,[13] two special problems are discussed. The first concerns the timing of orders and price data; the second, the pricing of goods made to specific orders.

To the extent that manufactured products are priced at the time the orders for them are received and accepted, it is precisely to the new-order series that the current price indexes would be applicable as deflators. Clearly, too, where the products so priced are not shipped immediately but require some time for production and delivery, the same indexes would often fail to be properly applicable as deflators of the data on the value of output or shipments. For the latter would then be recorded at the price of the period in which the order was accepted rather than at the price of the period in which the order was delivered, and the two may well differ. Of course, for new orders shipped from stock, whose value equals that of shipments of the same period, no complications of this sort can arise; as a rule, the current price is the right one to use for both the new order and the sales series.

What if the price was not contractually fixed at the time the order had been accepted? Where time-consuming production processes are involved, the long-term contract may provide that the price of the output shall be adjusted according to the changes in the input prices during

[13] See Appendix C.

the period set for the completion of the order. Such escalation provisions, based as a rule on the BLS wholesale price index, are common in certain industries.[14] In such cases, the precise contract sum (price of the preordered output at the time the order is accepted) is unknown. But if no other price has been specified at that time, then the price of the current (i.e., the order-acceptance) period can be presumed to apply; any subsequent price changes cannot, and need not, be taken into account in a deflation procedure whose aim can only be correction for current, not future, price changes.

Conceptually, then, the only real difficulty seems to be with those new orders that are contracted for at price levels different from those prevailing in the current period. This need not cause serious difficulty in practice.

The difficulty of pricing custom-made equipment gives rise to an important deficiency of the price data. The wholesale price indexes measure essentially the price movements in primary markets, where the goods are first sold commercially, ordinarily in large lots. But there is no "market price" in this sense for unique products, that is, for goods made to order and designed to meet individual customer specifications, such as planetarium equipment or an airliner. Although many of the technical or quality characteristics of such products may have a common valuation which they implicitly contribute to the product's transaction price, this price may vary with each buyer, since each purchase is likely to involve a different bundle of product attributes. The BLS has not found it possible to price directly such items as "ships and railroad stock, fabricated plastic products, and some machinery which is largely custom-made." [15]

The series of manufacturers' new orders in constant (average 1947–49) prices are presented in Chart 3-5 for the comprehensive industry groups and in Chart 3-6 for the major component industries. These series show much weaker upward trends than their undeflated counter-

[14] Cf. M. E. Riley, "The Price Indexes of the Bureau of Labor Statistics," in *The Relationship of Prices to Economic Stability and Growth*, Compendium of Papers Submitted by Panelists Appearing before the Joint Economic Committee, 85 Cong., 2nd sess., Washington, D.C., 1958, p. 114. The author notes that "virtually all of the heavy power-generating equipment produced is made under an arrangement by which the contract sum is adjusted for changes in the prices of selected materials and components between the initiation and completion of the job. Federal shipbuilding contracts contain similar provisions."

[15] "Wholesale Price Index," in U.S. Bureau of Labor Statistics, *Techniques of Preparing Major BLS Statistical Series*, BLS Bulletin 1168, Washington, D.C., 1954, p. 84.

On the construction of price deflators for the industries not covered in the BLS data (such as nonautomotive transporation equipment and printing and publishing), see Appendix C.

Chart 3-5
New Orders and Shipments in Constant Dollars and Production Indexes, All Manufacturing, Durable and Nondurable Goods Industries, 1948–58

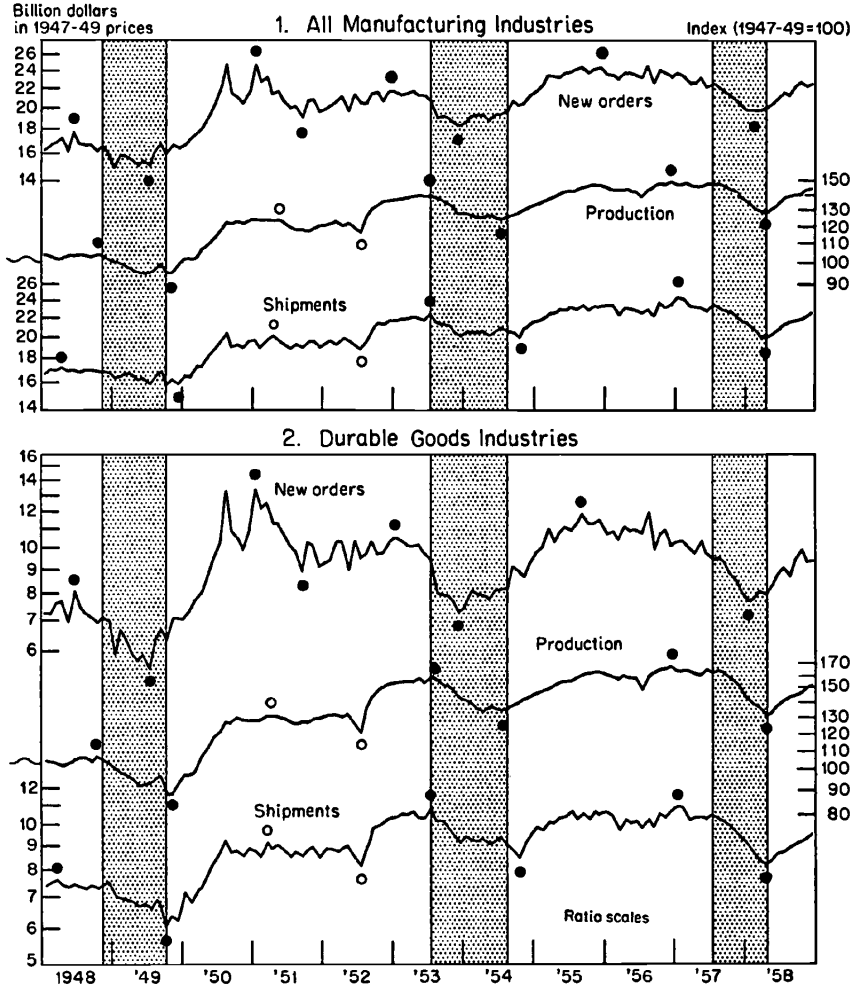
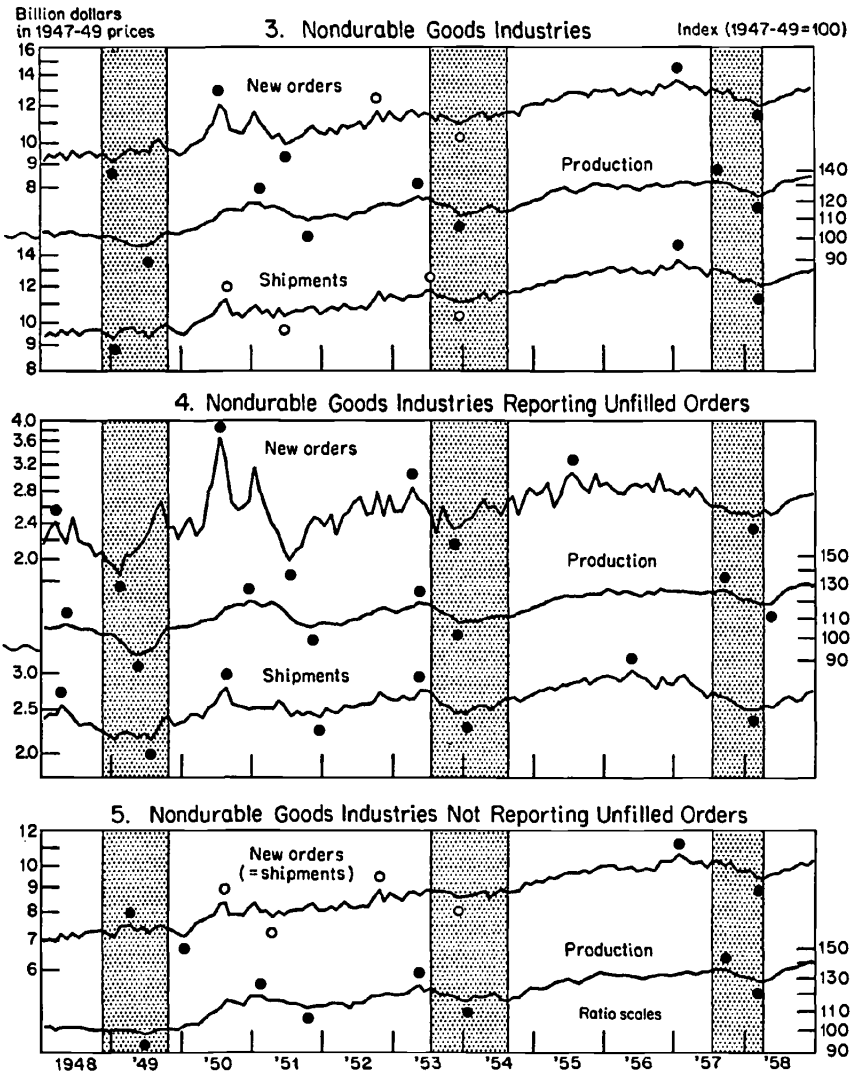


Chart 3-5 (concluded)



Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles; circles, retardations. Series are seasonally adjusted.

Chart 3-6
New Orders and Shipments in Constant Dollars and Production Indexes, Ten Major Manufacturing Industries, 1948–58

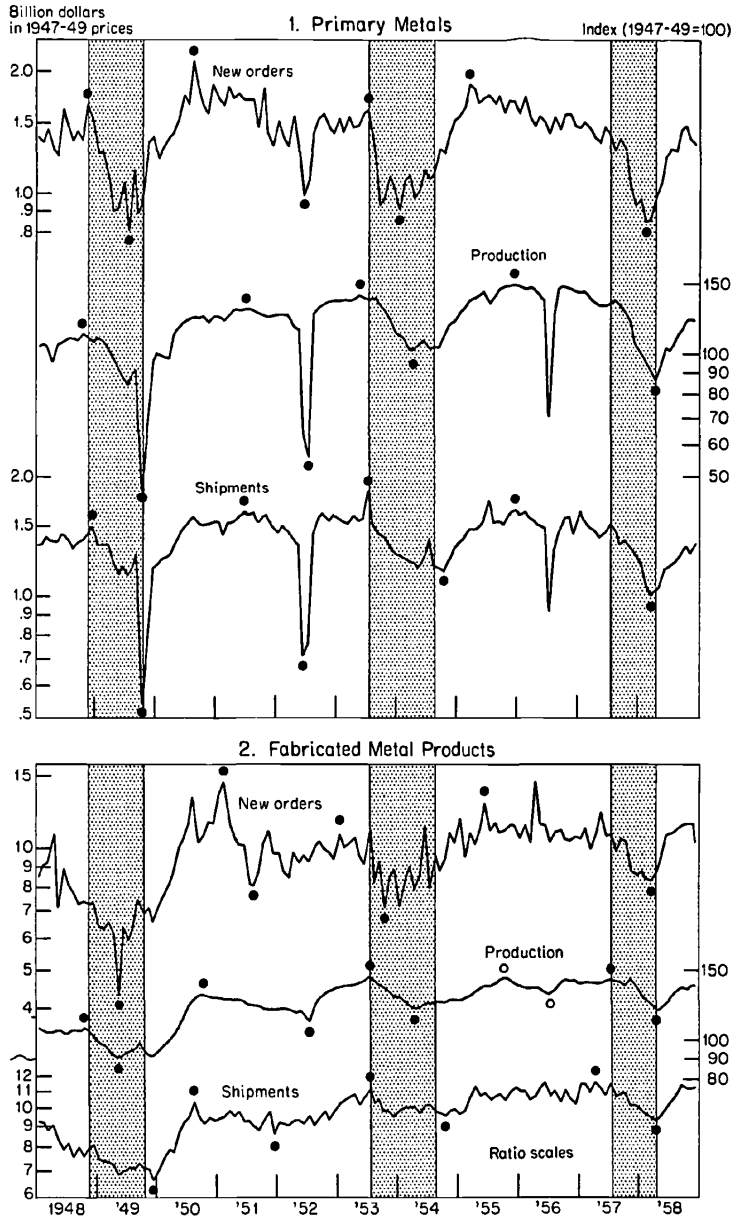


Chart 3-6 (continued)

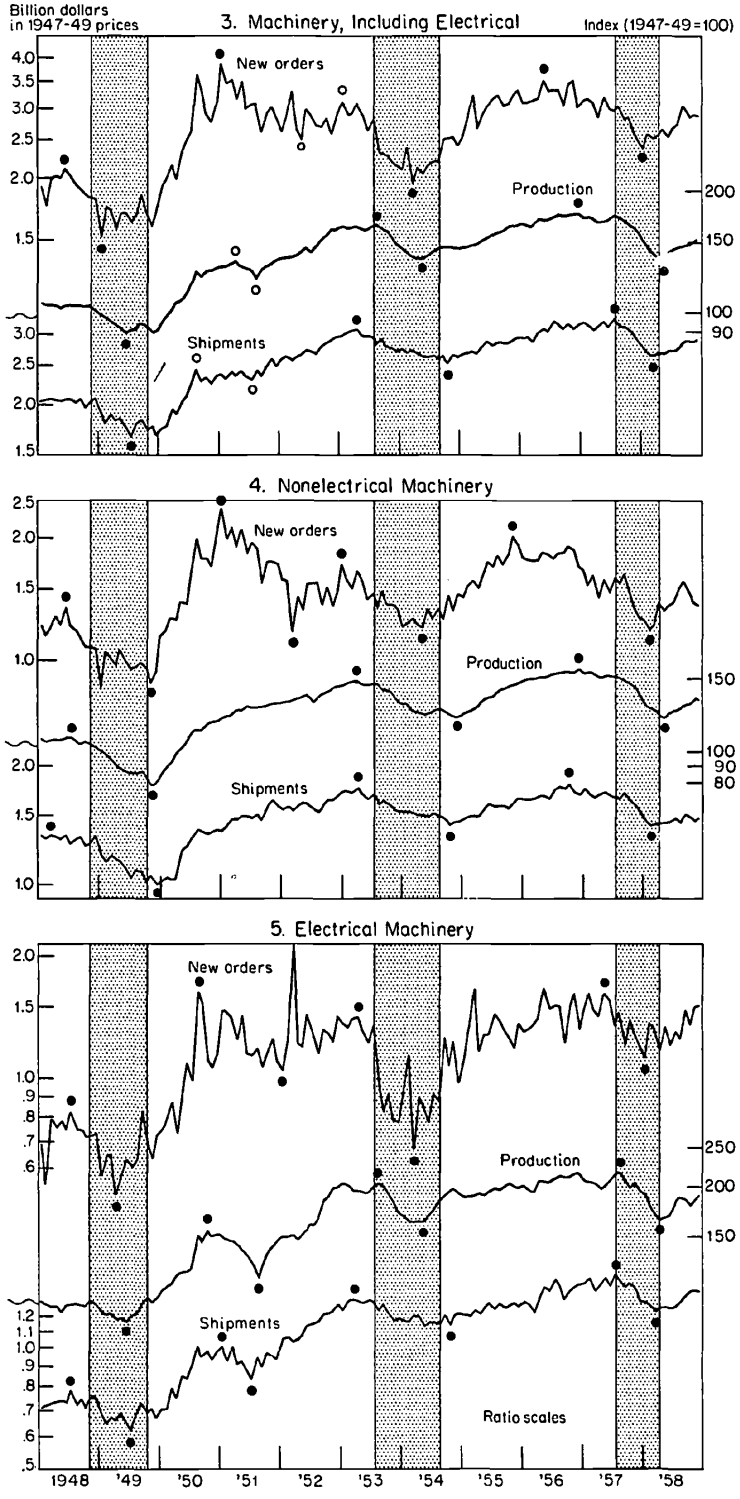
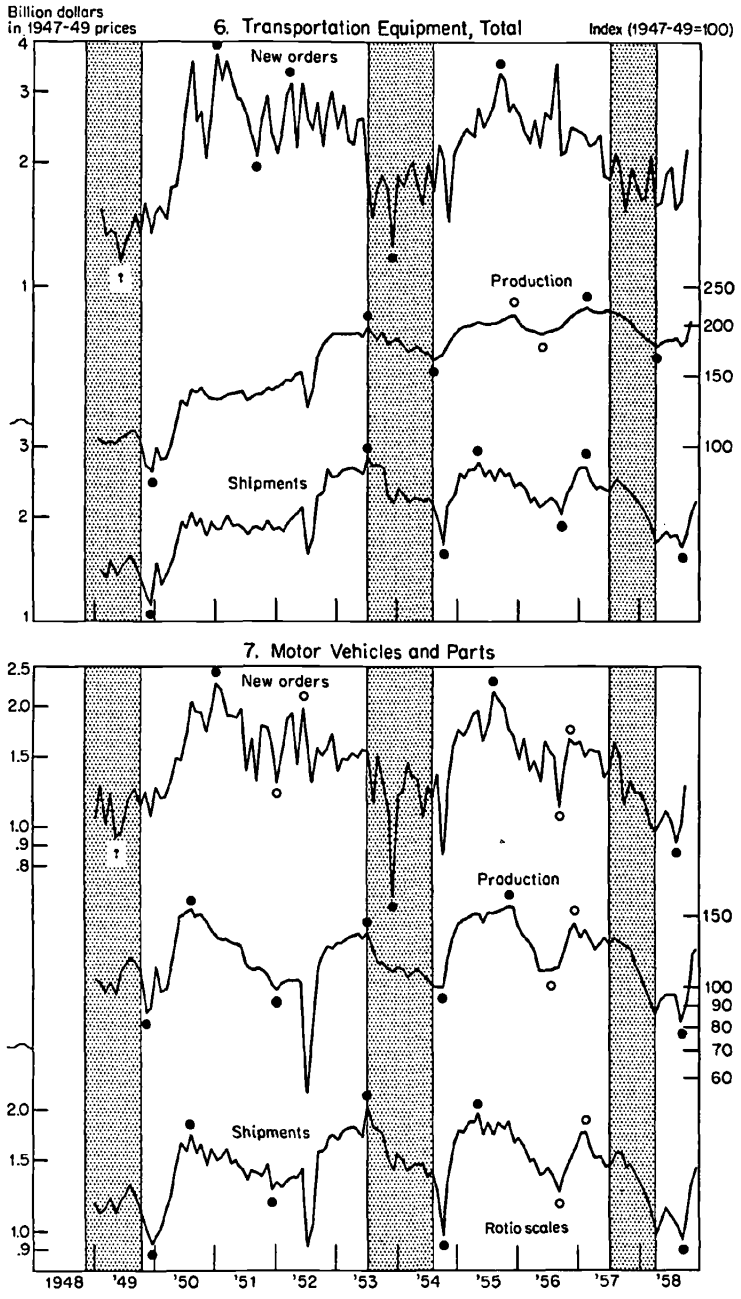
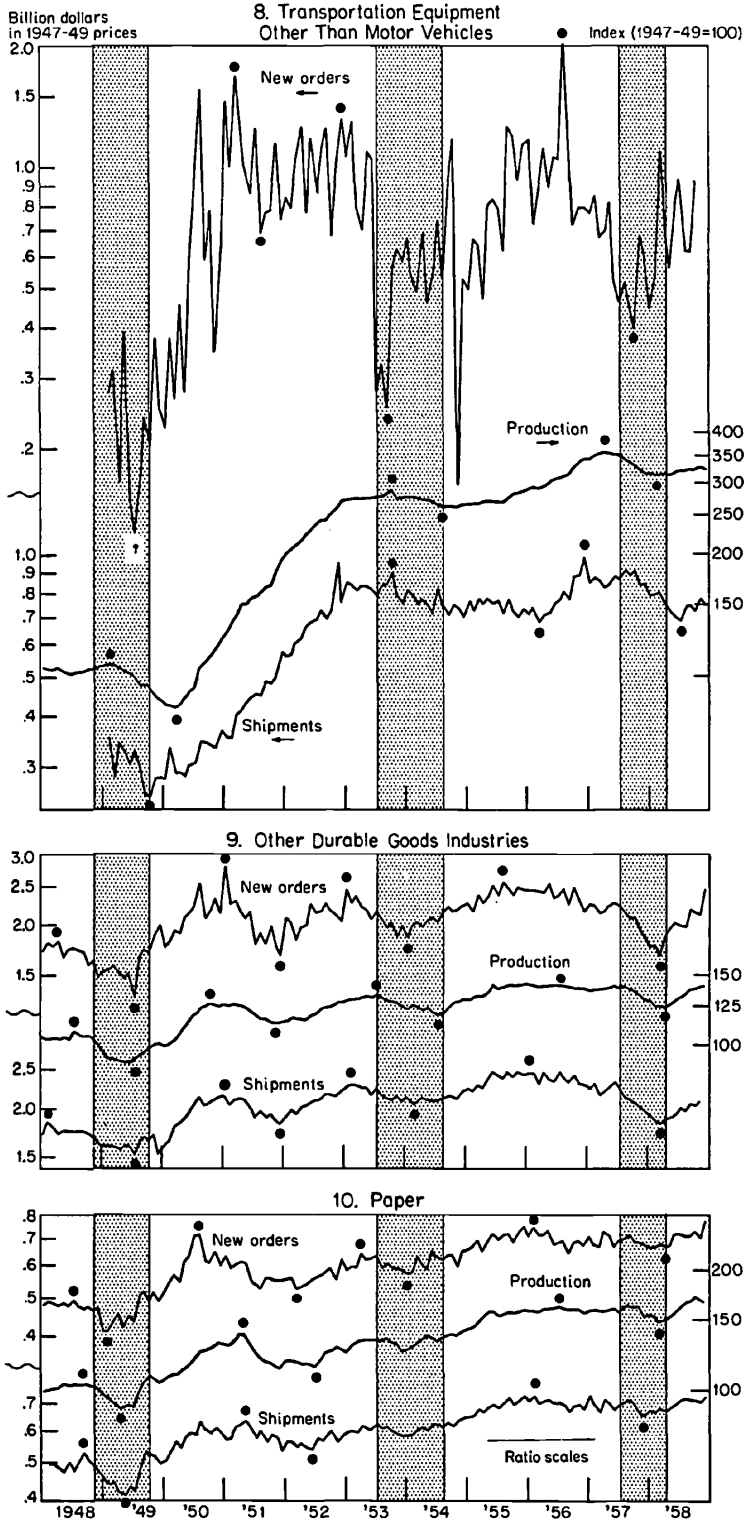


Chart 3-6 (continued)





Note: Shaded areas represent business cycle contractions; unshaded areas, expansions. Dots identify peaks and troughs of specific cycles; circles, retardations. Series are seasonally adjusted.

parts, which would, of course, be expected in view of the tendency for industrial prices to rise during most of the period covered. The short-term movements, on the other hand, were largely unaffected by the adjustment. The reason for this is that the price deflators are very smooth and stable, while the new-order series to which they were applied are much more volatile.

The observed differences in cyclical behavior between the corresponding constant-price series and current-price series are largely of the kind to be expected as a result of trend elimination. Thus, the amplitudes of the specific-cycle expansions tend to be somewhat smaller than those in the constant-price series. On the other hand, cyclical declines are often larger in the deflated than in the undeflated figures, but these differences are neither considerable nor systematic.

In addition to new orders in real terms, Charts 3-5 and 3-6 show, for each of the major industries or groups covered, the corresponding series on output and real shipments. Output is represented by the appropriate components of the monthly Federal Reserve Index of Industrial Production (1953 revision, 1947–49 = 100).[16] The series for shipments were constructed by deflating the OBE current-value figures by means of the same price indexes that were used to deflate new orders. To the extent that prices actually changed during the delivery periods, this clearly results in errors for goods which were made to order and priced as of the period in which they were ordered. On the other hand, in some cases current price deflators might apply better to shipments than to new orders; and in production to stock they should apply equally to both. In any event, there is no good practical alternative to the simple current-price deflation procedure we have adopted; any more elaborate method would merely be pretentious, for it would have to be based on necessarily arbitrary assumptions about the time aspects of pricing the made-to-order goods.

[16] For production, as for new orders and shipments, revised data became available after this analysis was completed. Examination of the new series indicates that our findings would not be materially affected by the use of the revised data.

Indexes for three industry groups (other durable goods and nondurable goods industries with and without unfilled orders) were computed by combining the Federal Reserve indexes for the component industries with weights derived from the 1947 value added weights used in the FRB compilation. Separate indexes for automotive and other transportation equipment were obtained through the courtesy of the Federal Reserve Board for the period before 1956, the year in which the published series for these industries begin.

Relative Movements of Real New Orders, Output, and Real Shipments

Major fluctuations in quantities ordered are typically reproduced, with lags, in the course of output, so that the phase-to-phase correspondence between these series is strong. But the cyclical movements are systematically larger in real new orders than in the corresponding output, and these differences are particularly pronounced for the durable goods industries.

The sequence of corresponding cycles in new orders and production may be interrupted by a wave of advance buying characterized throughout by an excess of the ordering rates over the capacity output rates. The statistical expression of a concentrated buying movement of this sort would be an "extra" cycle in new orders, absorbed largely by a gradual expansion of output and to a certain extent also by cancellations. Our materials include a single but very significant episode illustrating such developments: the 1950–51 phase of the Korean War as experienced by a large segment of durables manufactures. The chart for the durable goods sector as a whole shows production moving along a virtually horizontal plateau in the last quarter of 1950 and the first half of 1951, in contrast to new orders (measured net of cancellations), which first climbed to unprecedented peak levels in August 1950 and again in January 1951, then declined steeply through the first quarter of 1951. The principal point here is that throughout this period new orders were received at high rates exceeding those of current shipments, and the behavior of shipments mirrored that of production. New orders never fell below the level of shipments; so their contraction merely reduced the rates at which the backlog of unfilled orders, already very large, continued to increase. Total output of durables dipped only slightly in the summer of 1951, when the decline in new orders was nearly completed, but it remained close to its top levels and soon started moving gradually upward again, reflecting the upturn in buying in the last quarter of the year. After the mid-1952 steel strike, finally, the expansion of output resumed a more vigorous pace, feeding on the backlog which was then at its peak level, even though the recovery of new orders was only moderate and quite hesitant throughout. Thus both the huge 1950–51 humps and the irregular 1951–52 rise in new orders were translated into an almost continuous and gradual expansion of output.

Chart 3-6 suggests that these developments, which show up well on the graph for the total durable goods sector, are attributable mainly to nonelectrical machinery and transportation equipment (other than motor vehicles). In the other major component industries of the sector, the "Korean" cycles in quantities ordered did reappear in the time path of production, although in a strongly subdued form.

The cyclical paths of real shipments are closely similar to those of output of the corresponding durable goods industries, in both amplitude and timing. For a technical reason, output indexes overstate the degree to which the short irregular movements of new orders are smoothed out in scheduling production; the series on shipments involve less rounding and therefore retain more of the erratic components than do the output indexes.[17] This, however, is about the only major and persistent difference between the charted production indexes and deflated shipments series that the eye can detect.

A difficulty arises at this point because many of the individual industry components of the Federal Reserve production indexes are based in part on data for shipments. One saving feature is that shipments are often combined with inventory changes to get deflated value-of-output data. Also, the use of Census value data (after deflation) is mostly limited to the estimation of the annual indexes, whereas the monthly intrayear movements are based largely on the BLS man-hour data. Nevertheless, the close similarity of output indexes and deflated shipments in our charts is doubtless in some part a statistical artifact due to the incorporation of the shipments data in the production indexes. This is more true for the longer trends than for the shorter movements, with which I am primarily concerned, and it is also more true for some industries than for others.[18]

The contrast between real new orders on the one hand and output and real shipments on the other is well expressed in the two metalworking and the two machinery-producing industries, but it is particularly strong in transportation equipment. This is due primarily to the

[17] The Federal Reserve production indexes that are used are rounded off in a relatively drastic manner, to exclude fractions of an index point. The OBE series, on the other hand, are expressed in millions of dollars, while a monthly value of new orders or shipments will run into billions of dollars; as a result, the minimum changes in these series are many times smaller than those that can be expressed by the production indexes.

[18] Production indexes for steel mill products, a subgroup of primary metals, rely directly on data on mill shipments. This is the only one of the larger industrial subdivisions so affected, according to the descriptions in the Federal Reserve publications.

nonautomotive component of the latter group (Chart 3-6). It is clear that these observations support our earlier findings concerning the major importance of production to order in this large area of durable goods manufacturing. Also consistent with our earlier analysis is that for the "other durable goods industries," where production to stock has a greater weight, the differences among the three series are relatively small and real shipments at times (e.g., in 1955–58) resemble real new orders more than production.

For the group of nondurable goods industries reporting unfilled orders, real shipments follow the general cyclical course of output but at times show more similarity to deflated new orders (see 1950 and 1956–57 in Chart 3-5). It is, of course, necessary to assume that deflated new orders and shipments are equal for the large group of nondurable goods industries that do not report backlogs, since this is implied in the compilation of the underlying current-value data. The series for the total nondurable goods sector represent weighted composites of the figures for the above two groups and behave accordingly: most of the time, shipments and new orders move closely together, with production following along a fairly parallel course. There is a significant difference, however, in the early phase of the Korean War (1950–51), when two sharp but short bursts of advance buying were, to a large extent, smoothed out in both output and shipments of nondurable goods.

Relative Cyclical Amplitudes of Output and the Deflated Series

Table 3-3 summarizes measures of the amplitude of each successive expansion and contraction for all series covered in Charts 3-5 and 3-6. The amplitudes are expressed, as before, in percentages of the initial-turn levels.

The average amplitudes are larger for deflated new orders than for either output or deflated shipments of the corresponding industries. This holds true for expansions as well as contractions, and hence for total cycles (Table 3-3, columns 1–6). In virtually every set of average amplitudes for individual matched movements in each series, S and Z each exceeds N.[19]

[19] Some individual comparisons do not conform to the rule but these are concentrated in one period and the deviations are easily explained. The 1952–53 expansions in output and real shipments were larger than the 1951–52 expansions in real new orders for most durable goods industries. This is

Table 3-3
Average Percentage Amplitudes of Cyclical Expansions and Contractions of Output, New Orders, and Shipments in Constant Prices, by Major Manufacturing Industries, 1948–58

Industry	Average Percentage Amplitudes of Real New Orders (N), Output (Z) and Real Shipments (S)						Ratios of Average Percentage Amplitudes, All Cyclical Movements[c]		
	Expansions[a]			Contractions[b]					
	$\bar{N}$ (1)	$\bar{Z}$ (2)	$\bar{S}$ (3)	$\bar{N}$ (4)	$\bar{Z}$ (5)	$\bar{S}$ (6)	$\bar{S}/\bar{N}$ (7)	$\bar{Z}/\bar{S}$ (8)	$\bar{Z}/\bar{N}$ (9)
All manufacturing	+29	+21	+18	−13	−8	−7	.60	1.08	.65
Durable goods, total	+54	+30	+27	−25	−12	−14	.53	1.00	.53
Primary metals	+67	+66	+61	−39	−35	−36	.92	1.02	.94
Fabricated metal products	+66	+27	+24	−27	−11	−10	.35	1.12	.40
Electrical machinery[d]	+76	+50	+40	−24	−19	−11	.52	1.31	.68
Machinery, except electrical[d]	+63	+51	+43	−28	−20	−19	.67	1.14	.76
Motor vehicles and parts[e]	+73	+47	+48	−40	−32	−33	.72	0.95	.68
Transportation equipment excl. motor vehicles[e]	+329	+132	+123	−64	−8	−19	.36	0.99	.36
Other durable goods industries[f]	+37	+23	+23	−20	−11	−13	.63	0.94	.59
Nondurable goods, total	+19	+16	+15	−8	−6	−6	.79	1.00	.79
With unfilled orders[g]	+43	+19	+17	−21	−9	−11	.42	1.08	.45
Textile-mill products[e]	+86	+25	+25	−34	−18	−17	.36	1.05	.37
Leather and leather products[e]	+31	+17	+19	−23	−16	−17	.67	0.89	.59
Paper and allied products[e]	+47	+43	+39	−14	−11	−12	.85	1.04	.88

Notes to Table 3-3

[a] Movements corresponding to the 1949–51, 1952–53, and 1954–57 expansions in total manufacturing production (the rises in individual series may have different dates). The figures are averages of the percentage changes during the three expansions.

[b] Movements corresponding to the 1948–49, 1951–52, 1953–54, and 1957–58 movements in total manufacturing production (contractions all, except for some retardations in 1951–52; the declines in individual series may have different dates). The figures are averages of the percentage changes during the four contractions.

[c] Based on averages of rises and falls during the six expansion and contraction periods (see notes a and b). The averages are taken without regard to sign.

[d] Based in part on unpublished data received from the U.S. Department of Commerce, Office of Business Economics (OBE).

[e] Based on unpublished data received from OBE and seasonally adjusted by the electronic computer method for NBER.

[f] Includes professional and scientific instruments; lumber; furniture; stone, clay, and glass; and miscellaneous industries.

[g] Includes textiles, leather, paper, and printing and publishing.

The differences between the amplitudes of deflated shipments and output, on the other hand, are in most cases small, and almost always much less than the corresponding differences between the amplitudes of deflated shipments and new orders. Moreover, the differences between S and Z, unlike those between N and either S or Z, have no marked tendency to agree in sign. Of the 59 comparisons for the ten major industries covered, 35, or nearly 60 per cent, show output to have larger amplitude than shipments ($Z > S$) and the rest show the opposite.[20]

Columns 7–9 in Table 3-3 present the ratios of average relative amplitudes of real shipments to real new orders ($\bar{S}/\bar{N}$), output to real shipment ($\bar{Z}/\bar{S}$), and output to real new orders ($\bar{Z}/\bar{N}$). The corresponding ratios must satisfy the simple multiplicative rule $(\bar{S}/\bar{N}) \times (\bar{Z}/\bar{S}) = \bar{Z}/\bar{N}$.[21] This is a rough attempt to discriminate between the average effects that changes in unfilled orders and in finished-product stocks

clearly the consequence of developments in the early phase of the Korean War (1950–51). At that time, output and shipments of durables moved along a high ceiling; new orders climbed to unprecedented levels and then declined swiftly, but always exceeded shipments. The huge backlog of long-term orders thus accumulated, plus the effects of the mid-1952 steel strike, explain the large relative size of the output expansion of late 1952–53.

[20] For expansions, about 70 per cent of the comparisons show $Z > S$; for contractions; there is nearly an even division among instances in which $Z > S$ and $Z < S$.

[21] For some purposes, it would be more convenient to use differences instead of ratios, and actually I have examined both, but there is no point in duplicating this analysis. The multiplicative rule for the ratios (see text above) is replaced for the differences by the additive rule: $(\bar{S} - \bar{N}) + (\bar{Z} - \bar{S}) = \bar{Z} - \bar{N}$.

have upon the size of cyclical movements in output relative to the size of cyclical movements in real new orders. The relation of the amplitudes $\bar{Z}/\bar{N}$ is attributed entirely to the interaction of backlog changes and stock changes, the contribution of the former being measured by $\bar{S}/\bar{N}$ and the contribution of the latter by $\bar{Z}/\bar{S}$. In other words, we are dealing here with the relative role in manufacturing of "backlog adjustments" and "stock adjustments" (as introduced in Chapter 2); the role of the current price adjustments is suppressed by the use of deflated values.

A $\bar{Z}/\bar{N}$ ratio of less than 1 indicates a reduction in the cyclical amplitude (stabilization) of production. All these entries in Table 3-3 are less than 1 (column 9). The amplitude ratios suggest that the proximate reason why outputs are much more stable than new orders is that shipments fluctuate much less than new orders; it is not that outputs fluctuate less than shipments, for actually the amplitudes of Z and S differ little; when they do differ, the effect is often to cause increased rather than decreased cycles in production. Most of the $\bar{Z}/\bar{S}$ ratios for the combined rise-and-fall amplitudes exceed 1 (column 8), and the same applies to expansions; for contractions the record is more mixed, with relatively low ratios prevailing in the durable goods sector. In total manufacturing both the expansions and the contractions are on the average larger in output than in shipments. Industries with high (low) $\bar{Z}/\bar{N}$ values also have high (low) $\bar{S}/\bar{N}$ values, whereas the ratios $\bar{Z}/\bar{N}$ and $\bar{Z}/\bar{S}$ show no significant correlations except for contractions.[22]

These measures suggest that the net effects of accumulations and decumulations of finished inventories are relatively weak and more often destabilizing than stabilizing. In contrast, the net effects of changes in backlogs of unfilled orders appear to be as a rule stabilizing and strong.

Unpublished OBE data for subdivisions of the major manufacturing industries were used to construct some preliminary estimates for three groups of industries representing primarily the production of consumer durable goods, equipment, and materials. This was done in an early

[22] The correlation coefficient (r) for $\bar{Z}/\bar{N}$ with $\bar{S}/\bar{N}$ for expansions is .926; for contractions, .760; and for all cyclical movements, .949. The corresponding figures for the correlation of $\bar{Z}/\bar{N}$ with $\bar{Z}/\bar{S}$ are .288, .569, and .040.

attempt to approximate for new orders and shipments some of the market-category data as provided in the FRB compilation for industrial production.[23] The resulting group aggregates were adjusted for price changes by means of the BLS wholesale price indexes.[24]

Despite their relative crudeness, these estimates are not devoid of interest; however, only a broad summary of what they show seems warranted. The average percentage amplitudes of cyclical movements are larger for equipment and the consumer durables group (which includes the volatile motor vehicle industry) than for materials. This applies to all three variables, i.e., to $\bar{N}$, $\bar{Z}$, and $\bar{S}$ (see tabulation below).

	Average Percentage Amplitudes (rise and fall)		
	Real New Orders ($\bar{N}$)	*Output* ($\bar{Z}$)	*Real Shipments* ($\bar{S}$)
Consumer durable goods	45	33	32
Equipment	49	31	27
Materials	31	25	22

The cyclical movements of real shipments for the equipment group are on the average only a little more than half the size of the corresponding movements of real new orders; for consumer durables and materials, the fluctuations of shipments are reduced relative to those of new orders by approximately 30 per cent. That the smoothing or stabilizing effect of backlog variation is particularly strong for equipment would be expected; that it is still considerable for the other groups deserves some emphasis.

For equipment and materials, the relative amplitudes of rise and rise-and-fall are on the average larger in output than in shipments, suggesting again some (not very strong) destabilizing effects of finished-inventory changes. For contractions, however, $\bar{Z}/\bar{S}$ is 1 or less.

[23] The new Census data of the 1963 vintage include market-category series that are undoubtedly superior to these estimates. However, the new series (introduced earlier in this chapter; see Chart 3-3 and text) do not extend back before 1953 and have not been analyzed in deflated form.

[24] The deflators for the three groups were, respectively, the index of consumer durable goods prices, the index of producer finished goods prices, and a weighted combination of price indexes for materials and components used in manufacturing and construction (1957–59 = 100).

The above interpretation of the average amplitude relations makes no allowance for the differences in timing of the cyclical movements that are being compared. This, however, can hardly be a source of significant error in our broad conclusions. Cyclical phases in the corresponding series of new orders, output, and shipments show a high degree of positive conformity and are well matched in our measurements. Even the longest of the time intervals between the paired turning points in these series are short relative to the duration of the cyclical phases. The results based on the averages seem representative and strong enough; consequently, it is unlikely that they would be materially altered by minor adjustments of the method applied. Moreover, they are supported by independent evidence on the cyclical behavior of manufacturers' finished-goods inventories and unfilled orders (Chapter 10).

Evidence for Other Series and Periods

Average Amplitudes of Component Movements: 37 Industries, 1953–63

Amplitude measures of a different type are obtained from computer programs for seasonal adjustment based on the ratio-to-moving-average method.[25] Here each series is divided into three components, *Cy* (the cycle-trend), *Se* (the seasonal), and *I* (the irregular). Each monthly value of the original series (*Or*) is assumed to be a product of the three, i.e., $Or = Cy \times Se \times I$, and the seasonal adjustment reduces the series to $Cy \times I$. Monthly percentage changes are computed for the original and seasonally adjusted series and also separately for each of the component series. When these figures are averaged without regard to sign, the result is five measures of average month-to-month percentage change (AMPC) relating to the original series ($\overline{Or}$), the seasonal factor series ($\overline{Se}$), the seasonally adjusted series ($\overline{CyI}$), the trend-cycle series ($\overline{Cy}$), and the irregular series ($\overline{I}$).[26]

[25] For a detailed description of this method, see Julius Shiskin, *Electronic Computers and Business Indicators*, Occasional Paper 57, New York, NBER, 1957; and Julius Shiskin and Harry Eisenpress, *Seasonal Adjustments by Electronic Computer Methods*, Technical Paper 12, New York, NBER, 1958. The seasonal adjustment and time series analysis program was developed at the Bureau of the Census and the National Bureau of Economic Research by Julius Shiskin and associates.

[26] The AMPC for the seasonally adjusted series, $\overline{CyI}$, is computed by dividing the moving seasonal factors into the corresponding figures of the original series, month by month. $\overline{Cy}$ is the AMPC

The relations among these measures are also of interest. In particular, attention must be given to $\bar{I}/\overline{Cy}$, the ratio that shows the size of the irregular relative to that of the cyclical component, on a single month basis. When the ratios $\bar{I}/\overline{Cy}$ are computed for periods of two, three, or more months, their value declines rapidly because the cyclical amplitude ($\overline{Cy}$) cumulates steadily, while the irregular amplitude ($\bar{I}$) remains about the same. On a month-to-month basis, the irregular factor is usually larger, often much larger, than the cyclical factor. As the span over which the percentage changes are computed is increased, however, the value of $\bar{I}$ sooner or later falls below the value of $\overline{Cy}$. A measure labeled MCD (index of months required for cyclical dominance) records the number of months in that span for which the ratio $\bar{I}/\overline{Cy}$ first declines below 1.

Finally, there is another simple measure that has a time dimension, but which takes into account only the direction and not the amplitude of changes in the series. The "average duration of run" (ADR) is the average number of consecutive months during which a series has been moving in the same direction.[27] Table 3-4 presents the monthly percentage amplitudes of the cyclical and irregular components, as well as the related measures $\bar{I}/\overline{Cy}$, MCD, and ADR, for a large number of paired current-dollar series on new orders and shipments compiled by the Bureau of the Census.[28]

The amplitude figures for the major industries and the still more comprehensive sectoral aggregates tend to be substantially smaller than the averages of movements in the component series. This is presumably because divergencies in timing result in partial smoothing out of the component fluctuations in aggregation. But in all cases, for comprehensive groups and their individual components alike, the average monthly percentage changes are greater in new orders than in

in a fifteen-month weighted moving average (Spencer graduation) of the seasonally adjusted data. (We shall often refer to $\overline{Cy}$ as the "cyclical" component, although it contains also trend elements. The series in our samples are often not long enough to show pronounced secular trends, whereas their cyclical sensitivity is typically high.) $\bar{I}$ is the AMPC in the monthly ratios of the seasonally adjusted series to its Spencer graduation.

[27] For a full description of this measure, see W. Allen Wallis and Geoffrey H. Moore, *A Significance Test for Time Series*, Technical Paper 1, New York, NBER, 1941; and Geoffrey H. Moore, *Statistical Indicators of Cyclical Revivals and Recessions*, New York, NBER, 1950, App. A.

[28] The series themselves are published for a much smaller number of major industries, but the descriptive statistics shown here were published in full industrial detail in 1963 as a part of the major revision of the official data formerly known as the Industry Survey (see text and note 1 at the beginning of this chapter).

Table 3-4

Average Monthly Percentage Amplitudes of Irregular (I) and Cyclical (Cy) Components and Related Measures in New Orders (N) and Shipments (S), Thirty-seven Industries, 1953–63

Industry	N or S	Average Monthly Amplitude of: Seas. Adj. Series $\overline{Cy}\overline{I}$	$\overline{I}$	$\overline{Cy}$	Ratio: $\overline{I}/\overline{Cy}$	MCD[a]	ADR[b]
All manufacturing	N	1.92	1.52	0.98	1.55	2	1.98
	S	1.35	0.98	0.75	1.31	2	2.55
Durable goods	N	3.79	3.25	1.61	2.02	3	1.67
	S	2.04	1.42	1.19	1.19	2	2.91
Primary metals	N	7.28	5.96	3.68	1.62	2	2.36
	S	5.21	3.98	3.24	1.23	2	2.91
Blast furnaces, steel mills	N	13.20	11.76	4.63	2.54	3	2.22
	S	3.55	2.45	2.54	0.96	1	2.76
Nonferrous metals	N	5.65	5.34	1.98	2.70	3	1.81
	S	3.45	2.73	1.87	1.46	2	1.99
Iron and steel foundries	N	5.82	5.05	2.46	2.05	3	1.74
	S	3.31	2.42	1.82	1.33	2	2.28
Fabricated metal products	N	5.55	5.32	1.42	3.75	4	1.52
	S	2.03	1.75	0.81	2.16	3	2.16
Cutlery, hand tools, hardware	N	8.33	8.25	1.66	4.97	5	1.56
	S	4.41	4.20	1.12	3.75	4	2.05
Building materials and wire products	N	6.49	6.18	1.46	4.23	4	1.56
	S	2.94	2.81	0.83	3.39	4	1.79
Machinery, except electrical	N	4.20	3.97	1.34	2.96	3	1.71
	S	1.46	1.19	0.90	1.32	2	1.95
Engines and turbines	N	10.82	10.32	2.14	4.82	6	1.76
	S	6.46	6.18	1.84	3.36	4	1.51
Farm machinery and equipment	N	9.44	8.86	2.16	4.10	4	1.74
	S	5.31	4.78	1.81	2.64	4	2.08
Construction, mining and material handling	N	6.65	6.33	2.34	2.71	3	1.69
	S	3.78	3.08	1.82	1.69	2	2.64
Metalworking machinery	N	9.02	8.67	2.46	3.52	4	1.81
	S	6.15	5.41	2.67	2.03	3	2.01
Machine tools, accessories, etc.	N	5.34	5.04	1.93	2.61	3	1.58
	S	3.47	2.96	1.67	1.77	2	2.03
Special industry machinery	N	8.29	7.92	2.35	3.37	4	1.54
	S	5.23	4.96	1.45	3.42	4	1.76
General industrial machinery	N	5.34	5.14	1.34	3.84	4	1.47
	S	3.66	3.41	1.27	2.69	3	1.67
Office and store machines	N	5.42	5.11	1.37	3.73	4	1.64
	S	3.08	2.80	1.08	2.59	3	1.85

(continued)

Table 3-4 (continued)

Industry	N or S	Average Monthly Amplitude of: Seas. Adj. Series $\overline{Cyl}$	$\bar{I}$	$\overline{Cy}$	Ratio: $\bar{I}/\overline{Cy}$	MCD[a]	ADR[b]
Durable goods (cont.)							
Electrical machinery	N	7.48	7.26	1.99	3.65	4	1.60
	S	2.50	2.17	1.05	2.07	3	1.87
Transmission and distribution equipment	N	10.11	9.68	2.03	4.77	6	1.55
	S	3.59	3.32	1.33	2.50	3	1.81
Electrical industrial apparatus	N	10.95	10.40	2.72	3.82	4	1.52
	S	3.70	3.33	1.44	2.31	3	1.80
Household appliances	N	8.49	8.08	2.13	3.79	4	1.69
	S	6.23	5.80	2.31	2.51	3	1.67
Radio and TV	N	11.19	10.77	2.96	3.64	4	1.71
	S	7.98	7.02	3.20	2.19	3	1.83
Communication equipment	N	12.31	11.78	2.65	4.45	5	1.60
	S	4.22	3.68	1.91	1.93	3	2.15
Electronic components	N	10.66	10.07	2.60	3.87	4	1.63
	S	4.38	3.81	2.04	1.87	3	1.97
Transportation equipment	N	11.28	10.96	2.38	4.61	5	1.52
	S	3.62	3.02	1.68	1.80	3	2.19
Motor vehicle parts	N	12.77	12.00	3.52	3.41	4	1.71
	S	4.27	3.57	2.11	1.69	2	2.03
Aircraft and parts	N	266.43	261.40	5.47	47.79	6	1.52
	S	3.91	3.69	1.11	3.32	4	1.62
Shipbuilding and railroad equipment	N	26.44	25.84	4.26	6.07	6	1.52
	S	6.71	6.17	2.41	2.56	3	1.67
Scientific and engineering instruments	N	12.24	11.75	2.24	5.25	6	1.49
	S	3.21	2.89	1.14	2.54	3	1.85
Ordnance	N	14.12	13.79	3.11	4.43	6	1.62
	S	4.66	4.08	2.02	2.02	3	1.81
Household furniture	N	4.25	3.87	1.36	2.85	4	1.98
	S	3.38	3.03	1.29	2.35	3	2.03
Selected nondurable goods industries							
Broadwoven fabrics	N	6.23	5.88	1.52	3.87	5	1.69
	S	3.35	2.94	1.41	2.09	3	1.91
Knitting mills	N	8.10	7.66	1.87	4.10	5	1.74
	S	3.49	3.06	1.30	2.35	3	1.92
Leather, industrial products, and cut stock	N	12.23	11.81	1.79	6.60	6	1.84
	S	3.58	3.29	1.03	3.19	4	1.87

(continued)

Table 3-4 (concluded)

Industry	N or S	Average Monthly Amplitude of: Seas. Adj. Series $\overline{CyI}$	$\bar{I}$	$\overline{Cy}$	Ratio: $\bar{I}/\overline{Cy}$	MCD[a]	ADR[b]
Selected nondurables (cont.)							
Pulp and paperboard mills (except building paper)	*N*	2.38	2.24	.69	3.25	4	1.64
	S	1.51	1.12	.88	1.27	2	2.40
Newspapers, books, and periodicals	*N*	3.86	3.80	.64	5.94	6	1.49
	S	1.46	1.37	.45	3.04	3	1.81

Source: Bureau of the Census, *Manufacturers' Shipments, Inventories, and Orders, 1947–1963 (Revised)*, Washington, D.C., 1963, Appendix F, Parts VI and VII. For description of the measures, see text and note 25.

[a] MCD signifies months required for cyclical dominance.

[b] ADR signifies average duration of run of seasonally adjusted series.

shipments (in terms of the seasonally adjusted series, $\overline{CyI}_n > \overline{CyI}_s$, where *n* denotes new orders and *s*, shipments; see Table 3-4, column 1). Also without exception, the irregular component is larger in new orders than in shipments, that is, $\bar{I}_n > \bar{I}_s$ (column 2). The cyclical component in new orders exceeds its counterpart in shipments, $\overline{Cy}_n > \overline{Cy}_s$, for all but four of the thirty-seven industries listed (column 3). These measures, then, are in full agreement with the observations made earlier for the amplitudes of cyclical rises and falls in the major-industry series.[29] Indeed, along with similar results for other sets of data,[30] they emphasize the virtual ubiquity of the rule that *N* is both

[29] The $\overline{Cy}$ estimates enable us to compare the size of cyclical movements in different series, the task for which the relative cyclical amplitudes were previously used. The latter depend upon identification of the specific-cycle turns in the series: They measure the size of the *total* movement between such turns. The $\overline{Cy}$ figures, while also computed from seasonally adjusted data, measure changes in *smoothed* series on a *per month* basis; they do not require any explicit dating of the specific-cycle turns.

[30] Measures of average amplitudes of component movements have been computed for a large number of other series, notably the paired indexes of new orders and shipments for fourteen manufacturing industries in Standard and Poor's *Industry Surveys*. These independently collected data confirm strongly the findings reported in the text and provide some related evidence; in particular, they show that seasonal variations, too, are in most cases substantially larger in new orders than in shipments. However, to keep this discussion from becoming excessively long and detailed, these additional measures are relegated to Appendix D.

more cyclical and more irregular than S wherever the two variables differ.

The irregular-cyclical ratios $\bar{I}/\overline{Cy}$, taken over one-month spans, are larger for new orders than for shipments in all industries except one (column 4). The MCD index—the number of months required for the ratio $\bar{I}/\overline{Cy}$ to fall below unity—tends likewise to be larger for new orders. However, the MCD indexes are much less sensitive than the $\bar{I}/\overline{Cy}$ measures, and are sometimes equal for new orders and shipments; that is, $(MCD)_n \geq (MCD)_s$ (see the figures in brackets, column 4). Finally, the average duration of run, ADR, is inversely related to both $\bar{I}/\overline{Cy}$ and MCD, since it is larger for smooth than for erratic series; and, with but two exceptions, $(ADR)_n < (ADR)_s$ (column 5).

To facilitate an appraisal of these relations, ratios were computed of the corresponding measures for S and N.[31] These figures indicate how much smaller the movements of shipments are when compared with the movements of new orders; lower fractions are associated with greater reductions of the amplitudes. Many comparisons point in the expected direction. Thus, the ratios based on the comprehensive aggregates are throughout lower for the durable goods industries than for all manufacturing, which includes those nondurables that are produced to stock only (e.g., the $\overline{CyI}_s/\overline{CyI}_n$ figures are here .538 and .703, respectively). Consumer durables, such as household appliances, radio and television, and furniture, which tend to come in rather standardized models and are mass produced, have relatively high ratios: 0.7–0.8 for the seasonally adjusted series and irregular components and 0.9–1.1 for the cyclical components. In contrast, producer goods—most of the machinery and equipment items and materials supplied by the metalworking industries—have, as a rule, substantially lower ratios, varying from 0.2 to 0.6 for the averages $\overline{CyI}$ and $\bar{I}$, and from 0.5 to 0.9 for $\overline{Cy}$. The ratios for aircraft and parts are fractional and far lower than those for any other industry, especially for the seasonally adjusted series and irregular components. Other transportation equipment, instruments, and ordnance also have relatively low ratios.

The sample of nondurable items covered by these measures is small and biased in the sense that it includes only those nondurable goods in-

[31] The discussion that follows is based on a tabulation of five ratios—$\overline{CyI}_s/\overline{CyI}_n$, $\bar{I}_s/\bar{I}_n$, $\overline{Cy}_s/\overline{Cy}_n$, $(\bar{I}/\overline{Cy})_s/(\bar{I}/\overline{Cy})_n$, and $(ADR)_n/(ADR)_s$—which is not shown here; however, the ratios can, of course, be readily computed from the paired entries in Table 3-4.

dustries in which production to order is particularly important (see Table 3-4). Nevertheless, it is interesting to observe that the ratios for publishing and some textile and leather products are as low as the ratios for many equipment items or metal products. On the other hand, pulp and paperboard mills show a cyclical ratio of 1.275, one of four ratios exceeding unity and the highest in the collection.

The reduction of amplitudes is found to be decidedly greater for the irregular than for the cyclical movements. The ratios $\bar{I}_s/\bar{I}_n$ are, in almost all cases, smaller than the ratios $\overline{Cy}_s/\overline{Cy}_n$; the average of the former is 0.444 and that of the latter is 0.747 for the thirty-seven industries included. The ratios $\overline{CyI}_s/\overline{CyI}_n$, which can be viewed as weighted averages of the two component ratios, are larger than $\bar{I}_s/\bar{I}_n$ and smaller than $\overline{Cy}_s/\overline{Cy}_n$, but are as a rule considerably closer to the former than to the latter (their average is 0.482).

The ratios $(\bar{I}/\overline{Cy})_s/(\bar{I}/\overline{Cy})_n$ are, with a single exception, less than 1, averaging 0.581. This shows that the weight of the irregular relative to the cyclical movements is greater for new orders than for shipments. These ratios also show the extent to which the short erratic variations in N are more effectively smoothed out in S than are the longer cyclical changes, for they equal $\bar{I}_s/\bar{I}_n$ divided by $\overline{Cy}_s/\overline{Cy}_n$.

Since the ADR index is a measure of *duration* only, and ignores the *size* of the fluctuations, it need not always suggest the same degree of irregularity as the $\bar{I}/\overline{Cy}$ ratio. For example, a series may move up and down frequently in short erratic oscillations, but the latter may be small relative to the cyclical swings; or, conversely, the irregular movements may be less frequent but larger. The ratios $(ADR)_n/(ADR)_s$ average 0.844 and are on the whole larger than the ratios $\bar{I}_s/\bar{I}_n$ and $(\bar{I}/\overline{Cy})_s/(\bar{I}/\overline{Cy})_n$, which means that the frequency of the erratic movements is reduced relatively less than their size in the transition from new orders to shipments.

Cyclical and Irregular Components of New Orders and Other Comprehensive Indicators

This section summarizes the evidence on the relative amplitudes of selected comprehensive series, so as to compare new orders with several important economic indicators, in particular those relating to investment. Table 3-5 shows that the averages $\overline{CyI}$, $\bar{I}$, and $\overline{Cy}$ are all larger for the aggregates of new orders than for the corresponding production indexes. The measures of $\bar{I}/\overline{Cy}$ and MCD are also larger for

new orders, while those of ADR are smaller. This is true for the interwar as well as for the post-World War II period (see lines 1–5 and 10–15), although it should be noted that the comparability of the interwar measures suffers from the limited industrial coverage of the available new-order series. As would be expected, production, like shipments, is typically much smoother than new orders and subject to smaller cyclical movements.

It is well known that sales and production tend to be more stable for nondurable than for durable goods. In Table 3-5, this is clearly reflected in both the interwar and the postwar comparisons between total and durables production (lines 4–5 and 14–15). For new orders, similarly, the amplitude measures $\overline{CyI}$, $\bar{I}$, and $\overline{Cy}$ are smaller for all manufactures than for durable manufactures (lines 1 and 2).

Among the durables, it is the orders for capital goods, such as machinery and equipment, that have particularly large cyclical and irregular amplitudes. One tends to associate investment with high volatility and large fluctuations, and the figures in Table 3-5 are consistent with this notion. However, the average size and frequency of fluctuations of different types and phases of investment vary greatly. Thus, commercial and industrial construction contracts (floor space) show much larger cyclical and irregular amplitudes than new orders (compare lines 2–3 and 10–12 with lines 6 and 16, respectively).[32] By adding up for each month the value of new orders for machinery and equipment and the value of industrial and commercial building contracts, a comprehensive series of investment commitments (line 17) is obtained, with amplitudes similar to, but somewhat larger than, the equipment-orders component (lines 12 and 17). It is particularly interesting to compare the amplitude figures for new orders and contracts for plant and equipment with the corresponding measures for expenditures on plant and equipment; the former appear to be 2 to 4 times larger than the latter (lines 8 and 12). This contrast parallels that existing between new orders and production, and must be due to a similar smoothing process.[33]

[32] While the contracts series differ from the new-order series in breadth of coverage, this is unlikely to be the source of the observed amplitude differences. The prewar data and the Standard and Poor's indexes of new orders have a much narrower coverage than the postwar Commerce figures, but all of these series show substantially smaller amplitudes than the commercial and industrial building contracts.

[33] The timing of cyclical turns in the spending by business for fixed-capital formation tends to be roughly coincident with the average cyclical timing of production or shipments of investment goods. Both production and expenditures lag behind orders—contracts by intervals of several months. For the discussion of the investment orders data and what they show, see Chapters 9 and 10.

Table 3-5

Summary of Measures of Irregular (I) and Cyclical (Cy) Components for Comprehensive Series on New Orders and Selected Indicators, Interwar and Post-World-War-II Periods

Line		Average Monthly Amplitude of					
		$\overline{Cyl}$ (1)	$\overline{I}$ (2)	$\overline{Cy}$ (3)	$\overline{I}/\overline{Cy}$ (4)	ADR[a] (5)	MCD[b] (6)
	INTERWAR PERIOD						
1	New orders, composite index, 1920–33	7.7	6.4	3.4	1.9	2.13	3
2	Durables, 1920–33	8.5	7.1	3.9	1.8	2.43	3
3	Durables, 1929–39	7.8	6.5	3.8	1.7	2.18	3
4	Indus. prod., total, 1919–39	2.3	1.4	1.7	0.8	5.71	1
5	Durables, 1919–39	4.0	2.3	2.8	0.8	4.61	1
6	Comm. & indus. bldg. contracts, 1925–39	12.5	12.0	3.7	3.3	1.81	4
7	Resid. bldg. contracts, 1925–39	8.9	7.8	3.9	2.0	1.95	3
8	New incorporations (no.), 1923–39	4.2	4.1	1.0	4.2	1.65	4
9	Average, 12 aggregative series, 1919–39	5.1	4.5	1.9	2.2	2.67	2.7
	POST-WORLD WAR II PERIOD						
10	New orders, composite index, 1949–56	6.4	5.8	2.0	2.8	1.77	3
11	Durables, 1948–60	5.6	5.0	2.0	2.5	1.94	3
12	Machinery and equipment, 1948–60	6.1	5.6	2.2	2.5	1.68	3
13	Shipments, composite index, 1949–56	3.0	2.7	1.1	2.4	2.14	3
14	Indus. prod., total, 1947–56	1.1	0.7	0.7	0.9	3.52	1
15	Durables, 1947–56	1.7	1.1	1.0	1.1	4.07	2
16	Comm. & indus. bldg. contracts, 1948–60	12.4	11.9	2.8	4.3	1.62	5
17	New investment orders and contracts, 1948–60	6.4	5.9	2.2	2.7	1.59	3
18	New private nonfarm dwelling units, 1948–60	4.1	3.4	2.0	1.7	2.29	3
19	New business incorporations, 1948–60	3.0	2.6	1.3	2.0	2.19	3
20	Change in business inventories, 1947–58	n.a.	7.1	3.4	2.1	5.9	n.a.
21	Plant & equipment expenditures, total, 1947–58	n.a.	1.3	1.1	1.2	12.8	n.a.
22	Average, 12 aggregative series, 1947–56	4.9	4.4	1.4	2.7	2.3	3.0
23	25 indicators, 1947–58	n.a.	3.4	1.7	1.6	3.8[c]	2.3[c]
24	11 leading	n.a.	6.5	2.8	2.2	2.3[d]	3.1[d]
25	9 coincident	n.a.	1.2	0.8	1.5	3.4[e]	1.9[e]
26	5 lagging	n.a.	0.6	1.0	0.8	9.2[f]	1.3[f]

Notes to Table 3-5

Source: Lines 1 and 2: Department of Commerce indexes in physical terms, 1923–25 = 100. Durables include iron and steel (6 items); railroad transportation equipment (3 items); stone, clay, and glass (2 items); furniture, lumber (5 items), and flooring (2 items). The composite index also includes textiles (3 items), and paper and printing (3 items).

Line 3: National Industrial Conference Board index of the value of new orders for durable goods, 1935–39 = 100.

Lines 4, 5, 14, and 15: Federal Reserve Board index, 1947–49 = 100.

Lines 6, 7, and 16: F. W. Dodge Corporation series in units of floor space (millions of square feet).

Lines 8 and 19: Compiled by R. G. Dun & Co. (after 1933, Dun and Bradstreet, Inc.).

Line 9: Includes: (1) Wholesale price index, excluding farm products and foods, 1926 = 100, BLS; (2) index of factory employment, 1947–49 = 100, BLS; (3) industrial common stock price index, dollars per share, Dow-Jones; (4) index of business activity, AT&T; (5) see Source, line 6; (6) see Source, line 7; (7) see Source, line 8; (8) freight carloadings, thousands of cars per week, Association of American Railroads; (9) bank debits outside New York City, billions of dollars, FRB; (10) index of department store sales, 1947–49 = 100, FRB; (11) average hours per week, manufacturing NICB; (12) business failure, liabilities, millions of dollars, Dun and Bradstreet. The series cover the period 1919–39, with following exceptions: items (5) and (6), 1925–39; item (7), 1923–29; and item (11), 1920–39.

Lines 10 and 13: Standard and Poor's index of current value, 1949 = 100. For its composition, see Appendix B.

Lines 11 and 12: Census Bureau series based on data from the Office of Business Economics (OBE), Department of Commerce.

Line 17: Compiled by the Bureau of the Census from data of the OBE and F. W. Dodge Corporation.

Line 18: Housing starts in thousands of new private nonfarm dwelling units; from Bureau of the Census.

Line 20: Change in business inventories, farm and nonfarm, after valuation adjustment, in billions of dollars, OBE; quarterly series.

Line 21: Total business expenditures on new plant and equipment, billions of dollars; Securities and Exchange Commission (SEC) and OBE; quarterly series.

Line 22: Includes the items identified in Source, line 9; the source for item (11) is now BLS, and the base of index (1) is 1947–49 = 100.

Line 23: Includes all twenty-six business cycle indicators from the 1960 list of the National Bureau of Economic Research except manufacturers' new orders. Averages computed from data given in Julius Shiskin, *Signals of Recession and Recovery,* Occasional Paper 7, New York, NBER, 1961, Table B-1, pp. 143–44. Among the twenty-five series, eleven are leading indicators, nine are coincident, and five are lagging indicators. The corresponding measures for these three subgroups are listed on lines 24–26. The series and their sources are identified in G. H. Moore, "Leading and Confirming Indicators of General Business Change," in Geoffrey H. Moore, ed., *Business Cycle Indicators,* Princeton for NBER, 1961, Vol. I, Table 3-7, pp. 106–107.

[a] ADR signifies average duration of run of seasonally adjusted series.

[b] MCD signifies months of cyclical dominance.

[c] Average for nineteen series.

[d] Average for nine series.

[e] Average for seven series.

[f] Average for three series.

As a broadly conceived scale of reference against which to compare our amplitude measures for new orders and related variables, Table 3-5 also presents the corresponding average figures for groups of selected aggregative series (lines 9 and 22–26). These are groups of "business cycle indicators," i.e., series chosen for their relatively high cyclical sensitivity. It is clear that new orders are both more "cyclical" and more erratic than are even these sensitive indicators, on the average (compare lines 1–3 and 9, and lines 10–12 and 22–26).

The leading indicators, those whose turning points tend to precede the peaks and troughs in business activity, are the most sensitive in terms of monthly cyclical and irregular amplitudes. The "coinciders," i.e., those series which tend to reach cyclical turns at about the same time as the economy in general, have much smaller cyclical and irregular movements and are much smoother. And the "laggers," whose turns usually follow business revivals and recessions, are the least irregular, although perhaps about as "cyclical" (according to their $\overline{Cy}$) as the coinciders. All this can be seen by comparing lines 24, 25, and 26 in Table 3-5. Presumably, the processes that are particularly sensitive to cyclical influences are also highly sensitive to other short-term disturbances; and the earliness of cyclical reaction, as expressed in the tendency to lead, may often be another manifestation of that general responsiveness. The group of leading indicators which includes new orders for durable manufactures is heavily weighted with series relating to investment and profits. The cyclical and irregular amplitudes of new orders are somewhat smaller than the corresponding averages for all the other leading indicators combined, but new orders are slightly more erratic in terms of the $\bar{I}/\overline{Cy}$ ratios and ADR (lines 10–12 and 24).

Finally, comparisons of the $\bar{I}/\overline{Cy}$ ratios for new orders, production, and the indicator groups show generally higher figures in the post-World War II period than in the interwar period. In addition, the ADR indexes were usually lower and the MCD indexes higher in the postwar than in the interwar years. Thus the cyclical component has decreased relative to the irregular component. It is well known, of course, that the cyclical movements have generally been milder since World War II than in the twenties and thirties. Our findings reflect this tendency but they show, too, that various economic processes contributing to it, such as ordering or production, have retained their characteristic differences in cyclical and other short-run variability.

Specific Cycles and Erratic Movements in Individual Series, 1918–39

Data for various industries and products, covering different periods between 1918 and 1939 and subjected to the specific-cycle analysis of the National Bureau,[34] confirm the findings obtained by other methods for the more aggregative postwar series.

The figures in Table 3-6 cover three samples, each consisting of fourteen series: new orders (I), shipments and production (II), and selected aggregative indicators (III). Measures of the average amplitude of specific cycles for these series are shown in column 3 of the table and ranked in column 6. The product coverage of groups I and II is similar. Six of the fourteen items in the new-order sample are represented in group II by one series each (shipments only) and four by two series each (shipments and production). In contrast to these series, which are fairly narrow in scope, group III includes comprehensive indicators representing various activities: industrial production and employment.

The average of the ranks based on the amplitude figures (column 6) is 30.7 for the new-order series (group I), and 22.4 for the shipment and production series (group II). Ten of the group I ranks fall within the highest third of the total range, 29–42, three within the middle third, 15–28, and one within the lowest third, 1–14. For group II, the corresponding figures are four, seven, and three. The evidence of these measures is unequivocal: Cyclical swings in new orders are typically wider than their counterparts in shipments and production. Exceptions to this rule are exceedingly rare.[35]

In contrast to the figures of 30.7 for the individual new-order series and 22.4 for the activity series, the average rank of the amplitude measures for the comprehensive indicators (III) is only 11.4. This

[34] Specific cycles are broad swings in the seasonally adjusted series, of a duration roughly similar to that of business cycles (from over one year to ten or twelve years). Amplitudes of these movements are measured in "specific-cycle relatives," i.e., percentages of the average standing of the data during the given cycle. The rise from the initial trough to the peak is added to the fall from the peak to the terminal trough, disregarding the signs. Three-month averages centered on the trough and peak dates are used in these computations to diminish the influence of random factors. Measures for successive specific cycles covered by a series are averaged to obtain the presumably typical amplitude figure. For a detailed description of the method see Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, New York, NBER, 1946, pp. 131–41.

[35] The average amplitude of specific cycles is greater for shipments than for new orders in only one case of the ten in which data can be matched. There are no exceptions among the order-production comparisons. The systematic character of the amplitude differences can be traced back to the relative size of individual cycles matched in the corresponding order and activity series.

Table 3-6
Average Amplitude of Specific Cycles and Intensity of Irregular Movements, Forty-two Selected Series, 1918–38

Series[a]	Period Covered[b] (1)	No. of Complete Specific Cycles Covered (2)	Av. Amplitude of Specific Cycles[c] (rise + fall) (3)	Duration of Erratic Movements as % of Duration of Specific Cycles[d] (4)	Type of Erratic Movements[e] (5)	Ranks According to: Av. Amplitudes (col. 3) (6)	Ranks According to: Durations (col. 4) (7)
I. NEW ORDERS OF INDIVIDUAL INDUSTRIES OR PRODUCTS[f]							
Machine tools and forging machinery (OR)	1919–38	5	265.0	2.7	mild	34	9
Fabricated structural steel (OR)	1919–39	7	140.1	2.8	mod.	15	10
Oak flooring (ST)	1918–37	6	206.5	4.5	mod.	31	19.5
Architectural terra cotta (ST)	1919–37	5	205.4	4.5	mod.	30	19.5
Fabricated steel plate (OR)	1924–38	3	190.0	7.7	[g]	26	30
Railroad locomotives (OR)	1919–37	7	537.6	7.8	mod.	39	31
Southern pine lumber (ST)	1918–37	6	104.9	9.7	mild	12	34
Merchant pig iron (OR)	1919–24	2	373.8	12.1	pron.	36	35
Railroad freight cars (OR)	1918–38	8	551.5	13.0	pron.	42	36
Railroad passenger cars (OR)	1919–37	7	498.0	13.6	pron.	38	37
Lavatories (ST)	1918–28	3	226.7	15.2	mod.	33	38
Bathtubs (ST)	1918–23	2	381.1	16.0	mod.	37	39
Steel sheets (OR)	1919–32	4	187.9	17.4	pron.	25	40
Sinks (ST)	1918–28	3	209.0	18.0	mod.	32	41.5

II. INDICATORS OF ACTIVITY FOR INDIVIDUAL PRODUCTS[f]							
Shipments							
Lavatories (ST)	1919–24	2	160.4	0.0	mod.	20	3.5
Steel sheets (OR)	1919–32	4	130.4	3.1	mild	13	13
Railroad locomotives (OR)	1920–38	6	328.2	3.4	mod.	35	14.5
Oak flooring (ST)	1918–37	6	154.0	3.7	mod.	17	16
Railroad freight cars (OR)	1919–38	6	540.6	5.7	mod.	41	22
Bathtubs (ST)	1918–24	2	156.4	7.0	mod.	19	27
Southern pine lumber (ST)	1919–38	6	83.0	7.6	mild	10	29
Sinks (ST)	1919–24	2	148.2	8.8	mod.	16	32
Railroad passenger cars (OR)	1919–40	7	539.1	9.6	mod.	40	33
Merchant pig iron (OR)	1919–24	2	162.6	18.0	mod.	21	41.5
Production							
Merchant pig iron (OR)	1919–24	2	200.4	0.0	mild	29	3.5
Southern pine lumber (ST)	1918–38	5	84.0	3.0	mild	11	12
Oak flooring (ST)	1918–38	5	155.0	5.8	mod.	18	23.5
Steel sheets (OR)	1919–33	5	174.8	5.8	mod.	24	23.5
III. SELECTED COMPREHENSIVE INDICATOR SERIES[h]							
Wholesale price index, BLS	1922–39	4	34.0	0.0	mild	2	3.5
Index of factory employment, BLS	1919–36	5	49.2	0.0	mild	4	3.5
Business activity index, AT&T	1919–37	6	65.6	0.0	mild	7	3.5
Indus. common stock price index, Dow-Jones	1921–38	4	138.8	0.0	mild	14	3.5
Comm. and indus. bldg. contracts, fl. space, Dodge	1919–38	5	195.4	0.9	mod.	28	7
Indus. prod. index, FRB	1919–38	5	72.5	1.7	mild	8	8
Residential bldg. contracts, fl. space, Dodge	1918–37	6	169.9	2.9	mild	22.5	11
Av. hrs. of work, mfg., NICB-BLS	1921–38	5	31.0	3.4	mild	1	14.5
Freight car loadings, AAR	1918–38	5	49.4	3.9	mild	5	17
Bank debits outside NYC, FRB	1921–38	3	79.2	4.0	mild	9	18
New incorporations, no., Evans	1918–39	5	57.1	4.8	mild	6	21
Railroad operating income, ICC	1920–38	5	169.9	6.0	mod.	22.5	25
Dept. store sales index, FRB	1921–38	4	37.5	6.7	mild	3	26
Bus. failures, liabilities, indus. & comm., Dun's	1922–38	4	190.4	7.2	pron.	27	28

Notes to Table 3-6

[a] (ST) signifies goods made primarily to stock; (OR), goods made primarily to order.
[b] Identifies the complete specific cycles covered by the series.
[c] For explanation see footnote 34.
[d] See explanation in text.
[e] Mod. signifies moderate; pron., pronounced. See explanation in text.
[f] Corresponding data on new orders, shipments, and production are available for all the series included in groups I and II except machine tools and forging machinery, fabricated structural steel, architectural terra cotta, and fabricated steel plate.
[g] Erratic movements range from moderate to pronounced.
[h] Group III includes eleven series selected from those listed and identified in Geoffrey H. Moore, *Statistical Indicators of Cyclical Revivals and Recessions*, New York, NBER, 1950, pp. 64–65. The factory employment index, the NICB segment of the average hours of work series, new incorporations, and the department store sales index are historical equivalents of current indicators.

The group also includes three series—the wholesale price index, the business activity index, and railroad operating income—taken from Wesley C. Mitchell and Arthur F. Burns, *Statistical Indicators of Cyclical Revivals*, New York, NBER, 1938, Table 2 and pp. 8–10.

illustrates the difference in the average size of cyclical fluctuations that is frequently observed between data of narrow scope and comprehensive aggregates. In view of the variety of the activities represented in group III, however, it is noteworthy that only four of these indicators have average cyclical amplitudes approaching the size of the *median* amplitude of the order group, 217.8 (others are all considerably smaller than the first quartile for that group).[36]

New orders show larger cyclical amplitudes than shipments or production not only for the goods classified as made primarily to order but also for those made primarily to stock (see column 8 for identification of these categories among the series included in groups I and II). On general grounds, one would expect that the amplitude reductions, in relative terms, will be on the average greater for items manufactured largely to order than for items manufactured largely to stock. On the whole, this expectation is not borne out by the data in Table 3-6,[37] but then we are dealing here with a small sample which does not represent strongly or sharply the distinction between the two types of manufac-

[36] The four are railroad operating income, liabilities of business failures, residential building contracts, and commercial and industrial building contracts. No comprehensive and continuous new-order series for the total interwar period is available for inclusion in group III, but it can be assumed on the basis of more recent records that such a series would show specific cycles of comparable size.

[37] Using averages weighted by the numbers of specific cycles covered (column 2) and including only the items for which matching series on new orders, etc., are available (as indicated by asterisks in column 8), the following results are obtained:

ture. What does come out clearly in these comparisons is that the amplitudes are generally larger for the goods made primarily to order than for the others, and this applies to new orders as well as to shipments or production.

Short movements that run counter to the specific-cycle phases are frequent in many monthly or quarterly time series adjusted for seasonal variation. Such "irregular" movements seldom last longer than a few months but may sometimes be quite large. It is often their duration rather than their amplitude that distinguishes them from the specific cycles. A simple and helpful, though indirect and rough, measure of their intensity has been developed as a by-product of the National Bureau method of tracing specific-cycle patterns. It is a percentage ratio relating the total duration of interstage intervals showing countercyclical movements to the total duration of all specific cycles covered.[38]

These measures of relative duration of countercyclical movements are entered in column 4 and (in the form of rankings) in column 7 of Table 3-6. They clearly indicate that series of new orders for manufactured products tend to have more pronounced irregular fluctuations than the corresponding shipment or production series. The comprehensive indicators are much less "irregular," as one would expect, since nonsynchronous erratic movements in the component series tend to cancel out in the aggregate. The average ranks of the duration percentages for groups I, II, and III are 30, 21, and 13.5, respectively. Of the ranks in the highest third of the total list (29–42), ten are in group I, four in group II, none in group III; the lowest ranks again are heavily concentrated in the set of the comprehensive series.

	Average Amplitude of Specific Cycles			*Ratio of Amplitudes (per cent)*	
	New Orders (1)	*Shipments* (2)	*Production* (3)	*Col. (2) / Col. (1)*	*Col. (3) / Col. (1)*
Items made to order (5)	459.3	393.3		85.6	
Items made to stock (5)	196.9	127.8		64.9	
Items made to order (2)	249.9	141.1	182.1	72.9	56.5
Items made to stock (2)	155.7	118.5	119.5	76.8	76.1

[38] Each specific cycle in a series is divided into nine stages covering the initial trough (I), the three successive thirds of the expansion (II, III, IV), the peak (V), the three successive thirds of the contraction (VI, VII, VIII), and the terminal trough (IX). Stages I, V, and IX are three-month periods centered on the turning points of the specific cycle. Nine-point patterns are computed, one for each cycle, by averaging the specific-cycle relatives for the months included in each stage. For a full discussion of the method see Burns and Mitchell, *Measuring Business Cycles*, pp. 144–60.

Furthermore, according to these measures, the irregular movements are more frequent in new orders than in shipments for both the goods made primarily to order and the goods made primarily to stock, while their frequency is least in production, again for either type of manufacture. The degree to which the erratic element in shipments is reduced vis-à-vis new orders should be greater for products manufactured largely to order, but this is not demonstrated here. The present data are too limited to provide conclusive evidence on this rather fine point. The measures do suggest strongly that new orders as well as shipments are more erratic for items produced chiefly to order than for items sold chiefly from stock.[39]

The duration percentages are crude estimates of the relative importance of the irregular factor. What is only a marked discrepancy in the basic (seasonally adjusted) data between the *rates of change* before and after a turning point may be translated into artificial irregularities in the averages of a specific-cycle pattern.[40] Conversely, considerable irregularities of the data can be smoothed out in the patterns. Therefore, the method of specific-cycle analysis calls for a reappraisal of the judgments based on the duration measures alone, by means of independent detailed examination of the series, aided by the data charts. The National Bureau rates the cycles of each of the series it analyzes as "mild," "moderate," or "pronounced," according to the relative intensity of erratic movements. For the forty-two series in Table 3-6 these ratings are given in column 5. In a number of cases these ratings differ from those which would be dictated by the duration percentages alone. However, they point to the same general conclusion as those

[39] The tabulation below shows weighted averages computed analogously to those listed in footnote 37 for the specific-cycle amplitudes; they are based on the entries in Table 3-6, column 4, which relate the duration of erratic movements to that of specific cycles.

	Average Relative Duration of Erratic Movements			*Ratios of the Durations (per cent)*	
	New Orders (1)	*Shipments* (2)	*Production* (3)	*Col. (2) / Col. (1)*	*Col. (3) / Col. (1)*
Items made to order (5)	12.4	6.8		54.8	
Items made to stock (5)	10.8	5.8		53.2	
Items made to order (2)	15.6	8.1	4.1	51.9	26.3
Items made to stock (2)	7.1	5.6	4.4	78.9	62.0

[40] Thus, suppose the monthly values of a series are 7, 7.5, 8, and 8.3 in stage IV, and 8.5, 9, and 5 in stage V (around the peak). The average for stage IV (7.7) will be higher than that for stage V (7.5), even though the monthly figures show no changes bearing irregular signs.

percentages, namely, that data on new orders rank high among economic time series in the importance of the irregular factor.

Summary

Industrial companies generally manage to schedule production so as to make its flow over time substantially less variable than the flow of demand they face. Data for various industries and periods, on different levels of aggregation and in both nominal and "real" terms, testify that new orders (N) typically have larger relative amplitudes of cyclical movements than the corresponding series on output (Z) and shipments (S). Also, short irregular variations are generally more frequent and pronounced in N than in S and Z. Finally, the seasonal fluctuations are in most cases larger in N, though these differences seem more moderate. On a per month basis, the amplitude reductions that are observed in the transition from new orders to shipments tend to be larger for the irregular than for the cyclical movements.

The industries that face greater instability of demand, i.e., greater variability of cyclical and irregular movements in new orders received, show on the whole larger amplitude reductions in S as compared with N than do the industries that enjoy more stable demand for their products. The variability of new orders is reduced most in shipments of machinery, metal products, and, particularly, nonautomotive transportation equipment. Other major industries have N and S series that run much closer to each other. These include some industries that produce largely to stock and some that work with relatively short average delivery periods.[41]

According to the Census data for market categories, fluctuations of both new orders and shipments tend to be smallest for consumer goods, larger for materials (particularly those supplied by the cyclically sensitive metalworking industries), and by far the largest for producers' durable equipment. The groups with greater relative amplitudes are also, on the whole, the groups in which production to order is more important. However, production is largely to stock and demand is highly variable for the important *sui generis* category of motor vehicles. The

[41] Let us recall that in the official Commerce statistics most of the nondurable goods sector is assumed (not entirely convincingly) to produce to stock only, i.e., to have $N = S$.

differences between N and S are small and mostly irregular for this group and for consumer goods in general, while they are large and to a considerable extent systematic for producers' equipment. New orders for defense equipment have fluctuated widely and erratically, but the production smoothing process appears to be very effective for these products, which have large and variable backlogs (reflecting long and variable delivery periods).